COESAM/PDFC-89/09

GULFPORT HARBOR

MISSISSIPPI

FINAL ENVIRONMENTAL IMPACT STATEMENT

US Army Corps of Engineers
Mobile District

JUNE 1989

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Describes the impacts to significant resources associated with the proposed action and alternatives to that action.

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ENVIRONMENTAL IMPACT STATEMENT

GULFPORT HARBOR
HARRISON COUNTY, MISSISSIPPI
NAVIGATION IMPROVEMENTS

TABLE OF CONTENTS

TABLE OF CONTENTS
(Cont'd)

LIST OF TABLES

LIST OF FIGURES

FINAL
ENVIRONMENTAL IMPACT STATEMENT

GULFPORT HARBOR
HARRISON COUNTY, MISSISSIPPI
NAVIGATION IMPROVEMENTS

The responsible lead agency is the U. S. Army Engineer District Mobile.

Abstract. The Mobile District has investigated public concerns of the Gulfport, Mississippi, area related to providing increased width and depth in the Gulfport Harbor deep draft navigation project. A draft survey report, including the draft Environmental Impact Statement (DEIS), was filed with the Council on Environmental Quality (CEQ) on June 7, 1976. Based on the comments received on the DEIS, a revised DEIS was filed with CEQ on July 20, 1977. An Addendum to the revised DEIS, containing coordination and comment and responses on the revised DEIS, was filed with the U. S. Environmental Protection Agency on December 18, 1977. This report was transmitted to Congress on November 23, 1978. These documents recommended the construction of a 36- by 300-foot channel in Mississippi Sound and a 38- by 400-foot channel across Ship Island bar into the Gulf of Mexico. This recommendation also included the modification of the existing harbor dimensions, realignment of the channel through Ship Island Pass, and the construction of a deposition basin for littoral drift at the west end of Ship Island. A total of 23.79 million cubic yards of material would be removed during construction of the project; 8.15 million by hopper dredge for disposal in the Gulf of Mexico; and 15.64 million cubic yards would be deposited by pipeline dredge in Mississippi Sound. Two economically and engineeringly feasible methods were under consideration for disposal of the Mississippi Sound material: (1) placement in a thin layer over sound bottoms and (2) construction of three islands in the sound. During annual maintenance of the project, up to 3.74 million cubic yards of material would be deposited in open water on both sides of the sound channel and up to 0.44 million cubic yards would be hopper dredged in the gulf. The report recommended that authorization of Phase I design memorandum stage of advance engineering and design be accomplished rather than construction. Studies to be conducted during Phase I investigations would determine which of the alternatives would be implemented should the project be authorized (USACE 1976). The Addendum to the revised DEIS indicated that all feasible alternatives would be considered during the Phase I investigations, including the use of specially designed equipment (Gulf disposal of Mississippi Sound material) (USACE 1978).

Improvement of the Gulfport Harbor navigation project was initially authorized by the Fiscal Year 1985 Supplemental Appropriations Act (P.L. 99-88) in accordance with the 1976 Report. As a result of this authorization, studies were initiated relative to the construction of islands within the sound and the impacts of thin-layer disposal of new work material. This initial authorization was subsequently modified by The Water Resources Development Act of 1986 (P.L. 99-662). Section 202 (a) of P.L.

99-662 authorizes for construction: "The project for navigation, Gulfport Harbor, Mississippi: Report of the Chief of Engineers, House Document Numbered 96-18, at a total cost of $81,700,000, with an estimated first Federal cost of $61,100,000 and an estimated first non-Federal cost of $20,600,000; except that, for reasons of environmental quality, dredged material from such project shall be disposed of in open water in the Gulf of Mexico in accordance with all provisions of Federal law. For the purpose of economic evaluation of this project the benefits from such open water disposal shall be deemed to be at least equal to the costs of such disposal.

A revised DEIS, circulated in 1988, considered the widening and deepening of the existing Gulfport Harbor navigation channel from its current 30- by 220-foot dimensions in the turning basin, anchorage area, and Mississippi Sound and 32- by 300- foot dimensions in the Gulf of Mexico up to the authorized dimensions of 36 feet deep by 300 feet wide and 38 feet deep by 400 feet wide, respectively. Five alignments for the channel segment through Ship Island Pass are also considered. In addition the expansion of existing port facilities through fill of 29 acres of shallow bottoms adjacent to the western side of the port is considered. This expansion would be accomplished by the Port of Gulfport and is currently under review through the Corps of Engineers regulatory program (Department of the Army Permit Application Number 88-00954-L). Material from the construction and maintenance of the project would be disposed in the EPA-designated ocean dredged material disposal areas on either side of the Gulfport Channel south of Ship Island Pass. Mitigation for filling 29 acres of shallow bottoms will be accomplished by the Port of Gulfport under the auspices of the Corps regulatory program.

The Water Resources Development Act of 1988 (P.L. 100-676) further modified the authorized project to include: "...to dispose, inaccordance with all provisions of Federal law, of dredged material ...

(B) from construction of such project by thin layer disposal in the Mississippi Sound under the demonstration program carried out under paragraph(2);

(C) from operation and maintenance of such project by disposal in the Mississippi Sound under a plan developed by the Secretary and approved by the Administrator of the Environmental Protection Agency, if the Secretary, after consultation with the study team established under paragraph (3), determines that the report submitted under paragraph (2)(H) indicates that there will be no unacceptable adverse environmental impacts from such disposal ...".

The plan recommended in this Final EIS would result in the placement of approximately 1 million cubic yards of new work material in Mississippi Sound during the test of thin-layer disposal, the remaining new work material would be disposed in the EPA-designated ocean dredged material disposal sites at Gulfport. Future maintenance would be accomplished utilizing open water disposal areas in the Mississippi Sound, the littoral area in Ship Island Pass or the beach nourishment area at Fort Massachusetts, and the EPA-designated ODMDS. In addition, a three year

monitoring program is established to determine the impacts of this new work placement as well as the placement of maintenance dredged material in a thin-layer in Mississippi Sound.

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ENVIRONMENTAL IMPACT STATEMENT

GULFPORT HARBOR, MISSISSIPPI
NAVIGATION CHANNEL IMPROVEMENTS

1.0 **SUMMARY.**

1.1 **Major Conclusions and Findings.** The following plan for the improvement of the Gulfport Harbor navigation channel is recommended for construction (See Figures EIS-1, EIS-2, EIS-3, EIS-4, and EIS-5):

o Deepening the entrance and southern portion of the turning basin to 36 feet,

o Deepening the northern portion of the turning basin to 32 feet,

o Deepening the Mississippi Sound channel to 36 feet at the existing width of 220 feet,

o Deepening the Ship Island Pass and Gulf channels to 38 feet at the existing width of 300 feet,

o Realignment of the channel across the bar in Ship Island Pass approximately 1900 feet to the west along alignment A,

o Provision of bend widening at Station 415+07.68 (Bend 1 at width of 480 feet), Station 674+68.33 (Bend 2 at width of 660 feet), and Station 994+60.79 (Bend 3 at width of 824 feet),

o Disposal of suitable material dredged from the Ship Island Pass channel in the littoral zone southeast of Cat Island or in the beach nourishment area at Fort Massachusetts,

o Disposal of new work material dredged from the Mississippi Sound and Gulf of Mexico channels in the EPA-designated ocean disposal sites at Gulfport, except as described below,

o Disposal of approximately 1.5 million cubic yards of virgin material dredged from the harbor entrance area (turning basin) in the proposed Port of Gulfport expansion area,

o Disposal of approximately 1 million cubic yards of virgin material dredged from the Mississippi Sound channel in a thin-layer during the demonstration program investigating the effects of such disposal on marine resources, and

o Disposal of future maintenance material using a combination of open water disposal sites in Mississippi Sound, the littoral zone and/or beach nourishment sites, and the EPA-designated ocean disposal sites.

1.2 **Areas of Controversy.** None.

1.3 **Unresolved Issues.** The plan of study for the demonstration project has not been finalized. Meetings with the National Marine Fisheries have been scheduled for 21 - 22 February 1990 to resolve issues concerning monitoring aspects relative to marine mammal, reptile and fishery resources. Once finalized a copy of the plan will be provided to all interested parties.

1.4 **Relation to Environmental Requirements.** The recommended plan as well as the other alternatives are in compliance with applicable statutes and executive orders, as provided on Table EIS-1, for this stage of planning.

1.5 The Draft Environmental Impact Statement (DEIS) was filed with the Council on Environmental Quality (CEQ) on June 7, 1976; the first revised DEIS was filed with CEQ on July 20, 1977; an Addendum to the first revised DEIS was filed with EPA on December 18, 1977; the second revised DEIS was filed with EPA on November 11, 1988, the Final Environmental Impact Statement (FEIS) was filed with EPA on _____.

TABLE EIS-1

Environmental Statutes and Executive Orders

Federal Statutes

Archeological and Historic Preservation Act, as amended, 16 USC 469, et. seq.
Clean Air Act, as amended, 42 USC 1857h-7, et seq.
Clean Water Act, as amended, (Federal Water Pollution Control Act) 33 USC 1251, et seq.
Coastal Zone Management Act, as amended, 17 USC 1451, et seq.
Endangered Species Act, as amended, 16 USC 1531 et seq.
Estuary Protection Act, 16 USC 1221, et seq.
Federal Water Project Recreation Act, as amended, 16 USC 460-1(12), et seq.
Fish and Wildlife Coordination Act, as amended, 16 USC 661, et seq.
Land and Water Conservation Fund Act, as amended, 16 USC 4601-4601-11, et seq.
Marine Protection, Research and Sanctuaries Act, 33 USC 1401, et seq.
National Historic Preservation Act, as amended, 16 USC 470a, et seq.
National Environmental Policy Act, as amended, 42 USC 4321, et seq.
Rivers and Harbors Act, 33 USC 401 et seq.
Watershed Protection and Flood Prevention Act, 16 USC 1001, et seq.
Wild and Scenic Rivers Act, as amended, 16 USC 1271, et seq.
Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (PL 91-646)
The Gulf Islands National Seashore (GIN) System (PL 91-660)
Coastal Barrier Resources Act (PL 97-348)

Executive Orders, Memoranda, etc.

Flood Plain Management (E.O. 11988)
Protection of Wetlands (E.O. 11990)
Environmental Effects Abroad of Major Federal Actions (E.O. 12114)
Analysis of Impacts on Prime and Unique Farmland (CEQ Memorandum, 11 Aug 80)

2.0 NEED FOR AND OBJECTIVES OF ACTION.

2.1 Study Authority. Authority for this study is contained in Senate Public Works Committee Resolution adopted on September 23, 1965. This resolution requested that the Board of Engineers for Rivers and Harbors determine the advisability of modifying Gulfport Harbor. Further, Section 304 of the River and Harbor Act of 1965 authorized and directed the Secretary of the Army to begin survey scope studies. Preparation of a combined report was requested by the Chief of Engineers on October 4 1965.

The draft survey report, including draft Environmenta Impact Statement, was coordinated in June 1976 and subsequently revised in ily 1977 and December 1977. This report was transmitted to Congress in November 1978 and recommended the authorization of Phase I design memorandum stage of advance engineering and design be accomplished rather than construction. Studies to be conducted during Phase I investigations would determine which of the alternatives would be implemented should the project be authorized (USACE 1976). The final EIS would be prepared after conclusion of the Phase I studies. Improvement of the Gulfport Harbor navigation project was initially authorized by the Fiscal Year 1985 Supplemental Appropriations Act (P.L. 99-88) in accordance with the 1976 Report and subsequently modified by The Water Resources Development Act of 1986 (P.L. 99-662).

Section 202 (a) of P.L. 99-662 authorized for construction: "The project for navigation, Gulfport Harbor, Mississippi: Report of the Chief of Engineers, House Document Numbered 96-18, at a total cost of $81,700,000, with an estimated first Federal cost of $61,100,000 and an estimated first non-Federal cost of $20,600,000; except that, for reasons of environmental quality, dredged material from such project shall be disposed of in open water in the Gulf of Mexico in accordance with all provisions of Federal law. For the purpose of economic evaluation of this project the benefits from such open water disposal shall be deemed to be at least equal to the costs of such disposal".

The Water Resources Development Act of 1988 (P.L. 100-676) further modified the authorized project to include: "...to dispose, in accordance with all provisions of Federal law, of dredged material ...

(B) from construction of such project by thin layer disposal in the Mississippi Sound under the demonstration program carried out under paragraph(2);

(C) from operation and maintenance of such project by disposal in the Mississippi Sound under a plan developed by the Secretary and approved by the Administrator of the Environmental Protection Agency if the Secretary, after consultation with the study team established under paragraph (3), determines that the report submitted under paragraph (2)(H) indicates that there will be no unacceptable adverse environmental impacts from such disposal ...".

The 1977 revised draft discussed several possible techniques for the disposal of dredged material, however, due to the age of the revised draft

EIS and the information contained within it, as well as the authorizing legislation, the document was revised and re-coordinated prior to the preparation of the Final EIS.

2.2 **Public Concerns.** The economic structure of Harrison County is heavily dependent upon the provision of services to the tourist trade and benefits provided by the Port of Gulfport. Historically the port served lumbering and agricultural industries within Mississippi, changing in the 1970's to support industrial plants in the region and serving as the nation's number 1 banana port. In recent years, with the world-wide shift towards transport of containerized cargo, the Port of Gulfport has modified it's operations to meet these demands. Harrison County, therefore, depends to a large extent on the continual improvement of the Port of Gulfport and related channel activities to stay abreast of changes in world marine transport. Public concerns considered in the proposed study therefore primarily center around the need for improved waterborne transportation facilities at the Port of Gulfport. The General Design Memorandum, Gulfport Harbor, Mississippi, which accompanies this final EIS examines in detail, the problems, needs, and opportunities of the Port of Gulfport, Mississippi.

2.3 **Planning Objectives.** The following objectives are the basis for formulation of the alternatives considered in this study.

Improve the economic efficiency of moving commodities into and out of the Port of Gulfport.

Increase navigational safety in the Gulfport Harbor navigation channels, especially in channel bends, and reduce the chance of hazard to life and property.

Provide an adequate and acceptable dredged material disposal plan for project modifications and continued maintenance of the Gulfport Harbor channels.

Reduce or prevent additional saltwater intrusion into the groundwater aquifers.

Coordinate dredging and disposal alternatives so that no conflicts arise with existing management plans for the Gulf Islands National Seashore properties on the barrier islands adjacent to the channel system and the State of Mississippi's Coastal Management Plan.

Avoid irreversible commitments of resources to future uses.

Manage, protect, preserve, or enhance valuable resources such as:

- oyster reefs
- wetland and submerged habitats
- commercial and sport fish habitats.

Design and conduct a monitoring program to determine the effects associated with the thin layer disposal of new work and maintenance material on marine resources.

3.0 ALTERNATIVES.

3.1 **Plans Considered During the Study.** The 1976 Feasibility Report considered a number of plans for improvements at Gulfport. Included in these were widening the channel in Mississippi Sound to 300 feet at the existing 30-foot depth and deepening the channel in 2-foot increments to accommodate vessels ranging up to 35,000 dead weight tons (DWT) up to a maximum depth of 36 feet and widening the channel across the bar into the Gulf of Mexico to 400 feet at the existing 32-foot depth and deepening the channel in 2-foot increments to a maximum depth of 38 feet. Also included were the realignment of the Ship Island Channel, adjustment of the width of the turning basin and enlargement of the channel entrance to the turning basin. A number of disposal options were also considered including: open water alongside the channels, creation of islands within Mississippi Sound, thin-layer disposal within Mississippi Sound, and the use of specially designed equipment to transport the dredged material to sites within the Gulf of Mexico.

The plan recommended in the 1976 Feasibility Report consists of enlarging the ship channel to provide a depth of 38 feet and a width of 400 feet from the 38-foot depth contour in the Gulf of Mexico for a distance of about 9.1 miles to a point in Mississippi Sound near the western end of Ship Island; enlarging the channel through Mississippi Sound to a depth of 36 feet and a width of 300 feet for a distance of about 11.8 miles between the inner end of the gulf entrance channel and the turning basin at Gulfport; realigning the ship channel through Ship Island Pass to a location generally parallel to and about 1,000 feet west of that presently authorized, with a deposition basin for littoral drift 38 feet deep, 300 feet wide and 2,000 feet long adjacent to the east side of the channel at the west end of Ship Island; and enlarging and adjusting the dimensions of the turning basin and channel entrance by extending the southern limits of the basin seaward about 1,180 feet along the west pier and 2,300 feet along the west side of the ship channel, decreasing the width of the turning basin from 1,320 feet, as presently authorized, to 1,120 feet, and deepening the basin and adjusted channel approach to 36 feet. Channel excavation between the gulf and the deposition basin at the west end of Ship Island would be by hopper dredge, with materials deposited in a deep-water disposal area in the gulf. Excavation of the remainder of the ship channel, the deposition basin and the turning basin would be by hydraulic pipeline dredge, with the material either thinly spread over an area comprising 9,740 acres of bottom in the sound or used for the construction of three islands on the west side of the channel in the sound.

3.2 **Plans Eliminated From Further Study.** Improvement of the Gulfport Harbor navigation project was initially authorized by the Fiscal Year 1985 Supplemental Appropriations Act (P.L. 99-88) in accordance with the 1976 Report. As a result of this authorization, studies were initiated relative to the construction of islands within the sound, the impacts of thin-layer disposal of new work material, and the coastal processes associated with channel shoaling and the westward migration of Ship Island.

3.2.1 **Island Construction.** The construction of three islands in

Mississippi, as discussed in the 1976 report, was eliminated from further study for a number of reasons. Geotechnical studies, initiated after passage of P.L. 99-88, indicated that the predominant soils encountered in the Mississippi Sound Channel segment are plastic clays, poorly graded sands, and silty sands with occasional pockets of clayey sands and silty clays. From the harbor area to the vicinity of the Gulf Intracoastal Waterway, six to eight feet of clay overlie the sandy soils and in some areas no sand was found down to the maximum project depth of -40 feet MLLW. In addition, the majority of the clay soils existing in the harbor and channel down to the maximum project depth do not appear to have characteristics that would be conducive to clay ball formation.

A two dimensional, depth averaged, numerical model was developed during the Mississippi Sound and Adjacent Areas Study (USACE 1984). This model was used to simulate circulation and salinity patterns within the area of the existing Gulfport Harbor project and under a scenario involving construction of islands. Three islands were 'constructed' in Mississippi Sound on the west side of the channel covering approximately 520 to 700 acres. Comparison of the existing conditions to those projected with the three islands in place indicated that velocities were increased between the mainland and the closest island by approximately 0.2 to 0.5 fps and in the immediate vicinity of the other two islands. Since the velocities were projected to increase primarily near the islands, it would be possible for localized erosion of the islands to occur if protection was not provided. This information combined with the depth of water in the areas selected for island construction, the quantity of suitable material, and the soft foundation conditions in this area of Mississippi Sound indicated that island construction within the Sound was not economically feasible compared to other alternatives. In addition, the possibility of material being eroded from the islands and being returned to the channel was considered significant in terms of future maintenance of the channel.

3.2.2 **Channel Alignment Through Ship Island Pass.** Adjustments to the channel alignment through Ship Island Pass were investigated because of several bends which are difficult and hazardous to navigate. The original authorized channel extended straight across the bar at Ship Island Pass, roughly perpendicular to the length of Ship Island. As a result of the westward migration of the island, the western tip of the island encroaches into the ship channel. A study by the U.S. Army Waterways Experiment Station, Coastal Engineering Research Center (See Appendix B) indicates that the western end of Ship Island is migrating to the west at an approximate rate of 38 feet per year. Five different channel alignments were proposed to alleviate the problem of encroachment by the island (Figure EIS-6). Alignments A, B, C, and E are at varying distances west of the existing alignment. Alignment D would be a re-creation of the original authorized channel.

The 20-inch diameter crude oil submarine pipeline owned by the Chevron Pipeline Company crosses the existing navigation channel in Mississippi Sound. Implementation of alignment A would require the relocation of this pipeline from it's current depth. Implementation of any other alignment would not require relocation.

Although alignment A would require the initial excavation of more material than any of the other proposed alignments the long-term maintenance of alignment A is estimated to be significantly less than any other alignments. Table EIS-2 provides estimated quantities from each of the alignments for the authorized dimensions. As can be seen from this table, approximately 14.6 million cubic yards of new work material would be removed from Mississippi Sound and Ship Island Pass Channel segments with alignment A compared to 13.4 million cubic yards for alignment B which is the next highest quantity. Annual maintenance from these channels with alignment A is estimated to be 3.8 million cubic yards or 4.3 million cubic yards for alignment B which is the next highest maintenance quantity. Alternative alignments B, C, D, or E were eliminated from further consideration due to the economic and environmental impacts associated with their implementation.

3.2.3 **Channel Depths.** Channel depths of 30, 32, 34, 36, and 38 feet were considered during reformulation of the project in late 1987. The design vessel for the Gulfport Channel is a 35,000 dwt bulk carrier 686 feet long, with a 100-foot beam and a maximum draft of 38 feet. An operational static draft of 32 feet was assumed for the design purposes. These vessels, light loaded, have been utilizing the existing Gulfport Channel for a number of years. Based on the vessel characteristics and the physical environmental of the Gulfport area, allowances of 4 feet and 6 feet, respectively, were added to the operational static draft for the Mississippi Sound and Gulf channels, respectively. Channel depths of 30, 32, and 34 feet, therefore, were not considered in detail.

3.3 **Plans Considered in Detail.** The authorization contained in P.L. 99-88 was subsequently modified by The Water Resources Development Act of 1986 (P.L. 99-662). Section 202 (a) of P.L. 99-662 authorizes for construction: "The project for navigation, Gulfport Harbor, Mississippi: Report of the Chief of Engineers, House Document Numbered 96-18, at a total cost of $81,700,000, with an estimated first Federal cost of $61,100,000 and an estimated first non-Federal cost of $20,600,000; except that, for reasons of environmental quality, dredged material from such project shall be disposed of in open water in the Gulf of Mexico in accordance with all provisions of Federal law. For the purpose of economic evaluation of this project the benefits from such open water disposal shall be deemed to be at least equal to the costs of such disposal". Although this authorization specifies that dredged material will be disposed in the Gulf of Mexico, an alternative disposal concept, i.e., thin-layer disposal, was considered in detail to provide the basis for determining the economic benefits associated with gulf disposal. In addition to "No Action", four alternative plans for improving the Gulfport Channel were considered in detail. The aspects of each of these plans, denoted plans A, B, C, and D are detailed below. Many of the aspects are common to all plans as denoted in the discussion.

3.3.1 **"No Action" Alternative.** Maintenance of the existing project provides waterborne transportation via: an 8 mile long, 32-foot deep by 300-foot wide channel from the Gulf of Mexico across Ship Island Bar into Mississippi Sound, thence a channel 11 miles long, 30 feet deep by 220 feet wide to the 30-foot deep 1,320- by 2,640-foot turning basin. The project

TABLE EIS-2
Estimated New Work and Maintenance Quantities (cubic yards)
Authorized Project (Sound 36X300, Pass 38X400, Bar-38X400)

CHANNEL SEGMENT	ALTERNATIVE CHANNEL ALIGNMENTS A	B	C	D	E
Turning Basin					
new work	2,857,114	2,857,114	2,857,114	2,857,114	2,857,114
new O&M	265,072	265,072	265,072	265,072	265,072
exist O&M	418,428	418,428	418,428	418,428	418,428
Berth. Area					
new work	154,699	154,699	154,699	154,699	154,699
new O&M	30,000	30,000	30,000	30,000	30,000
exist O&M	30,000	30,000	30,000	30,000	30,000
Miss Sound					
new work	11,350,200	10,008,300	9,443,000	8,882,500	9,994,900
new O&M	554,051	1,066,413	1,271,552	1,263,338	1,256,445
exist O&M	2,650,847	2,650,847	2,650,847	2,650,847	2,650,847
Ship Island Pass					
new work	3,208,200	3,375,500	3,370,500	3,677,500	3,342,200
new O&M	295,513	293,311	312,558	279,680	305,644
exist O&M	263,481	263,481	263,481	263,481	263,481
Gulf Channel					
new work	4,319,900	4,319,900	4,319,900	4,319,900	4,319,900
new O&M	429,900	429,900	429,900	429,900	429,900
exist O&M	325,680	325,680	325,680	325,680	325,680
TOTALS					
new work	21,890,113	20,715,510	20,145,213	19,891,713	20,668,813
new O&M	1,574,536	2,084,696	2,309,082	2,267,990	2,287,271
exist O&M	3,688,436	3,688,436	3,688,436	3,688,436	3,688,436

also includes a 26 acre commercial small boat harbor with an entrance channel 8 feet deep by 100 feet wide by 4,300 feet long. Approximately 4 million cubic yards of maintenance material would be dredged from the anchorage area, Mississippi Sound and Ship Island Pass channels every 18 months by hydraulic pipeline dredge and placed in open water areas adjacent to the channel and at Old Fort Massachusetts on the west end of Ship Island (Figure EIS-7). Approximately 4,460 acres located on either side of the channel would be utilized for disposal. These areas are 2,500 feet from the channel, 1,000 feet apart, and are in water depths greater than 4 feet below mean low water. The beach nourishment site at Old Fort Massachusetts is approximately 60 acres in size and has been used on three occasions in the past. Approximately 400,000 cubic yards would be dredged from the Gulf

channel annually and disposed in the EPA-designated gulf disposal sites at Gulfport.

3.3.2 **Turning Basin and Entrance Channel Dimensions.** Public Law 99-662 authorized modification of the turning basin from 30 feet deep by 1320 feet wide by 2640 feet long to 36 feet deep by 1120 feet wide by 2640 feet long with enlargement of the entrance to the basin from a point 2300 feet south of the southeast corner and along an angle of about 45 degrees. The local sponsor for this project, the Mississippi State Port Authority at Gulfport, has investigated the stability of the existing East and West Pier wharves. As a result of these investigations and review of current and anticipated berthing practices, the Port Authority has proposed that a two tier basin be constructed. As shown on Figure EIS-1 the entrance and southern portion of the basin will be deepened to 36 feet as authorized. The northern portion of the basin will be deepened to 32 feet. An existing submerged timber and stone breakwater at the southern end of the turning basin will be removed during construction. The rock and debris will be stored on the east side of the port for future use. Approximately 1000 feet of stabilization will be required along the West Pier wharf. This aspect is common to all plans considered in detail.

3.3.3 **Channel Depth.** A channel depth of 36 feet in Mississippi Sound and 38 feet in Ship Island Pass and the Gulf of Mexico are common to all plans considered in detail. The actual dredge depth of these channels is 40 and 42 feet respectively, including advanced maintenance and allowable overdepth.

3.3.4 **Channel Width.** Determination of adequate channel width is based on traffic, vessel, channel, and sea characteristics. The existing channel widths are less than those prescribed for the design vessel. The guides utilized in channel design indicate that a width of 300 feet for the sound channel and 400 in the pass and gulf channels would be appropriate. However, pilots have been navigating the existing 220-foot wide channel for a number of years with the design vessel, and although they report some difficulty during periods of strong cross winds, no collisions or groundings attributable to insufficient channel width have occurred. In addition, vessels larger than the design vessel are safely using the Bayou Casotte channel at Pascagoula which is 38 by 225 feet. For this reason channel widths of 220 and 300 feet in the sound and pass/gulf, respectively were carried forward for detailed analysis along with the authorized width dimensions of 300 and 400 feet, for the sound and pass/gulf respectively. Alternative plans A and C represent the 220/300-foot dimension; plans B and D represent the 300/400-foot dimension.

3.3.5 **Ship Island Pass Channel Alignment.** As discussed earlier, only alignment A was carried forward for detail analysis. Alignment A would relocate the channel approximately 1900 feet to the west of Ship Island, eliminating the existing dogleg and delaying shoaling problems associated with the island migration for approximately 50 years. The abandoned portion of the existing channel would be used as a deposition basin along the east side of the new channel. This eliminates the need for the construction of the deposition basin as authorized in P.L. 99-662.

The submerged pipeline owned by the Chevron Pipeline Company would be relocated to a deeper depth along it's same alignment.

3.3.6 **Bend Widening.** Widening of the channel at each of the three bends as shown on Figure EIS-2 is provided to reduce navigation problems. The quantities of materials required to be dredged in bend widening have been included in the overall dredging quantities discussed below. This aspect is common to all plans considered in detail.

3.3.7 **Port Expansion.** The State of Mississippi Port Authority at Gulfport has determined that additional container storage space is needed for existing commerce, and anticipated increased future commerce, with or without the considered project improvement. Accordingly, in June 1988 the Port Authority filed application for a Department of the Army permit pursuant to Section 404 of the Clean Water Act (33 USC 1344) and Section 10 of the River and Harbor Act of 1899 (33 USC 403). The Port Authority plan for expansion would provide approximately 29 acres of storage on the west side of West Pier. The area to be filled is shallow estuarine bottoms varying from approximately -1 to -9 feet MSL. This area would be diked to a height of +10 feet MSL and approximately 1.5 million cubic yards of virgin material would be removed from an area near the entrance to the turning basin to fill the site. The area to be dredged to provide the fill would be dredged under the authorized plan for navigation improvements should the port expansion not occur. This aspect is common to all plans considered in detail.

3.3.8 **Disposal Alternatives.** As indicated earlier, two generic disposal methods are considered in detail, gulf disposal and thin layer disposal, along with littoral zone disposal and beach nourishment. Table EIS-3 presents a matrix of plan, channel segment, dredged material quantity, and disposal areas.

3.3.8.1 **Littoral Zone Disposal.** New Work and maintenance material dredged from the Ship Island Pass reach of the Gulfport Channel would be placed in a littoral zone disposal site west of the channel, southeast of Cat Island in 14 to 20 feet of water (Figure EIS-4). The disposal of the sandy material dredged from the pass reach into this area would supplement the littoral drift system of Cat Island and possibly the Chandeleur Island system. The disposal of these materials has been evaluated following the 404(b)(1) Guidelines in compliance with the Clean Water Act of 1977, 33 USC 1251 (See Appendix D). This aspect is common to all plans considered in detail.

3.3.8.2 **Beach Nourishment at Fort Massachusetts, West Ship Island.** The National Park Service, Gulf Islands National Seashore, in a letter dated August 1, 1988, asked that we consider the placement of suitable material dredged from the Ship Island Pass Channel on the shoreline adjacent to Fort Massachusetts as had been done in the past. Approximately 60 acres adjacent to the fort would be utilized for disposal of variable amounts of dredged material at four to six year intervals depending on the erosion rate of the island. The National Park Service would be responsible for the incremental cost of this disposal option over that described above for littoral zone disposal. In 1983, the last time beach nourishment was requested,

approximately 210,000 cubic yards of material was placed on the site. This aspect is common to all plans considered in detail.

TABLE EIS-3

Dredging Quantities by Plan and Disposal Area
(quantity X 1000 cubic yards)

DISPOSAL AREA	NO ACTION	PLAN A (220/ 300)	PLAN B (300/ 400)	PLAN C (220/ 300)	PLAN D (300/ 400)	MOD. PLAN A (220/ 300)
Port Expansion						
NW:	1,457	1,457	1,457	1,457	1,457	1,457
Mississippi Sound						
NW:	0	0	0	9,009	12,905	1,000
new O&M:[1]	0	0	0	330	849	330
exist. O&M:[1]	3,099	0	0	3,099	3,099	3,099
Littoral Zone[2]						
NW:	0	2,590	3,208	2,590	3,208	2,590
new O&M:[1]	0	190	296	190	296	190
exist. O&M:[1,3]	263	263	263	263	263	263
EPA ODMDS						
NW:	0	12,062	17,225	3,053	4,320	11,062
new O&M:[1]	0	608	1,279	278	430	278
exist. O&M:[1]	326	3,425	3,425	326	326	326

Notes: [1] Annual O&M quantities, total O&M quantity for reach is the sum of the new O&M and the existing O&M.

[2] Includes beach nourishment site at Fort Massachusetts.

[3] Existing O&M is currently placed in open water in Mississippi Sound, in the Gulf ODMDS, or used for nourishment at Old Fort Massachusetts.

3.3.8.3 **Gulf Disposal of the Gulf Channel Material.** New work and maintenance material dredged from the Gulf reach of the Gulfport Channel would be placed in two EPA-designated Ocean Dredged Material Disposal Sites (ODMDS) at Gulfport. These sites are designated by the following coordinates:

Eastern Site		Western Site	
30° 11' 10" N	88° 58' 24" W	30° 12' 00" N	89° 00' 30" W
30° 11' 12" N	88° 57' 30" W	30° 12' 00" N	89° 59' 30" W
30° 07' 36" N	88° 54' 24" W	30° 11' 00" N	89° 00' 00" W
30° 07' 24" N	88° 54' 48" W	30° 07' 00" N	88° 56' 30" W
		30° 06' 36" N	88° 57' 00" W
		30° 10' 30" N	89° 00' 36" W

The eastern site is approximately 0.7 nmi south of Ship Island containing an area of approximately 2.47 nmi^2 in water depths averaging 27 feet. The western site is approximately 1.2 nmi south west of Ship Island containing an area of approximately 5.2 nmi^2 in water depths averaging 24 feet. These sites have been used historically for the material dredged from the pass and gulf channels. This aspect is common to all plans considered in detail.

3.3.8.4 **Gulf Disposal of the Mississippi Sound Material.** New work and maintenance material dredged from the Mississippi Sound reach of the channel and the anchorage area would be placed in the two ODMDS's described above. This aspect is common to alternative plans A and B.

3.3.8.5 **Thin Layer Disposal of the Mississippi Sound Material.** The Mississippi Sound reach of the channel and the anchorage area would be dredged with a hydraulic pipeline dredge and disposed in a thin-layer (6 to 12 inches) over approximately 7000 to 9600 acres on either side of the Gulfport Channel within Mississippi Sound. This aspect is common to alternative plans C and D.

3.4 **Recommended Plan, Revised DEIS (Plan A).** The revised DEIS, which was coordinated in October 1988 recommended Plan A for the improvement of the Gulfport channel.

3.5 **Recommended Plan (Modified Plan A).** The Water Resources Development Act of 1988 (P.L. 100-676) modified the project as authorized by P.L. 99-662 to include: "...to dispose, in accordance with all provisions of Federal law, of dredged material ...

(B) from construction of such project by thin layer disposal in the Mississippi Sound under the demonstration program carried out under paragraph(2);

(C) from operation and maintenance of such project by disposal in the Mississippi Sound under a plan developed by the Secretary and approved by the Administrator of the Environmental Protection Agency if the Secretary, after consultation with the study team established under paragraph (3), determines that the report submitted under paragraph (2)(H) indicates that

there will be no unacceptable adverse environmental impacts from such disposal ...".

Approximately 1 million cubic yards of virgin material dredged from the Mississippi Sound reach of the channel will be placed in a layer no more than 12 inches in thickness over approximately 1,000 acres on the west side of the Gulfport Channel. This material, along with a portion of the maintenance material from the existing channel, will be monitored for a period of up to three years to determine the effects of this type disposal on marine resources. Future maintenance of the improved channel will follow existing practice, i.e. open water disposal in Mississippi Sound, littoral zone and/or beach nourishment at Fort Massachusetts, and gulf disposal in the EPA-designated ODMDs at Gulfport.

Features of the plan recommended for the improvement of the Gulfport channel (Modified Plan A) include:

o Provision of a 38- by 300-foot channel from the 38-foot depth contour in the Gulf of Mexico across Ship Island Bar into the Mississippi Sound.

o Provision of a 36- by 220-foot channel across Mississippi Sound from Ship Island Bar to the Turning Basin.

o Provision of a two tiered turning basin 1120 feet wide by 2640 feet long with enlargement of the entrance to the basin from a point 2300 feet south of the southeast corner and along an angle of about 45 degrees. The entrance and southern portion of the basin will be 36 feet deep, the northern portion of the basin 32 feet deep.

o Provision of widening of the bends.

o Removal of the submerged timber and stone breakwater.

o Realignment of the Ship Island Pass reach approximately 1900 feet west of the existing alignment.

o Disposal of approximately 1.5 million cubic yards of new work material dredged from the anchorage entrance area in a 29 acre Port expansion area.

o Disposal of sandy dredged material in a littoral zone site southeast of Cat Island. A total of 2,589,700 cubic yards of new work material and a total of approximately 22 million cubic yards of maintenance material would be disposed in this site over the 50 year project life.

o Disposal of new work material from the anchorage area and Mississippi Sound and Gulf channels in the EPA-designated ODMDS at Gulfport, except as described below. Approximately 11 million cubic yards of new work material and would be disposed in these sites.

o Disposal of 1 million cubic yards of new work material from the Mississippi Sound channel in Mississippi Sound under a thin layer demonstration program.

o Disposal of maintenance material from the turning basin and Mississippi Sound channels under a continuing practice of open water disposal in Mississippi Sound. Approximately 3.9 million cubic yards would be disposed on an 18 month cycle resulting in approximately 130 million cubic yards would be disposed over the 50 year project life. Continued open water disposal is dependent upon the results of the monitoring program described below.

o Disposal of maintenance material dredged from the Gulf Entrance channel in the EPA-designated ODMDS at Gulfport. Approximately 755,600 cubic yards would be disposed in these sites annually for a total of 38 million cubic yards over the project life.

o Design and conduct of a three year monitoring program to assess the impacts associated with the thin layer disposal of new work and maintenance dredged material (See Appendix D).

4.0 AFFECTED ENVIRONMENT.

4.1 General Environmental Conditions. Gulfport Harbor is a land filled harbor area on the southern shore of Harrison County in western Mississippi. Physiographically this area is in the Coastal Lowlands subdivision of the East Gulf Coastal Plain section of the Coastal Plain Province. This area ranges in elevation from sea level to about 30 feet. The essentially flat to gently undulating, locally swampy Coastal Lowlands are underlain by alluvial, deltaic, estuarine, and coastal deposits and merge with the fluvial-deltaic plains of the streams of the area. This portion of the Gulf Coast has been classified as an "alluvial" coast, a terraced, deltaic plain (Upshaw, Creath, and Brooks 1966). The slope of the plain is considered steep since it drops as much as 8 feet per mile in some areas. The marshes in this area are narrow and the river drainage basins small. (Water and Air Research, Inc. 1975) The shoreline in the vicinity of Gulfport Harbor consists of a manmade beach beyond a concrete seawall. The area offshore the barrier islands is part of the Mississippi-Alabama Shelf section of the Continental Shelf Province.

The barrier islands consist of a broad, well-developed beach backed by dunes on the gulf side. Beach and intermittent marsh occur on the north shore of the islands. The interior of the islands is either broad, low sand flats, 1 to 2 feet above sea level, with marshes and shallow lakes or vegetated beach ridges 5 to 15 feet above sea level. Erosion of the eastern ends of the islands and accretion on the western ends indicate considerable occurrence of longshore drift. The rate of accretion is greater than the rate of erosion so that the islands have migrated westward with time. The barrier island facies consist of well-sorted, medium-grained, mature quartzose sand containing less than 3 percent feldspar and having a mineral suite rich in staurolite and kyanite. The average width of the facies is 2.5 miles, with an average thickness of 40 feet. Immediately south of the barrier island system is a nearshore fine-grained facies similar in lithology to that of Mississippi Sound. Movement of sediment from the sound forms a fine-grained facies which overlaps the Mississippi-Alabama shelf sand facies in a zone about 7 miles wide, south of the islands.

The Mississippi-Alabama shelf is a triangular area, on the seaward side of the barrier islands, extending from the Mississippi River delta on the west to the DeSoto canyon south of Panama City, Florida on the east. The shelf is about 80 miles wide in the west and is an extensive, almost flat plain bounded on the landward side by the relatively steep but narrow shoreface of the Mississippi Sound.

Mississippi Sound is a shallow coastal lagoon, measuring 80 miles along the Gulf of Mexico coast from Mobile Bay, Alabama, in the east, to Lake Borgne, Louisiana, in the west. It is nine miles wide, measured along a north-south axis, extending from the Mississippi Coastline to a string of sandy barrier islands which separate Mississippi Sound from the Gulf of Mexico. The lagoon has a mean low water depth of only 10 feet and more than 99% of the system is shallower than 20 feet at mean low water.

Within recent geologic time, the shoreline of Mississippi has altered frequently. Sea level has varied from about 20 feet to -350 feet in response to continental glaciation and melt. During the time of greatest glaciation, sea level was 300 to 350 feet lower than the present level and streams entrenched themselves in deep narrow valleys. In the last 5000 years the sea level has stabilized at its present level with the valleys and lowlands filled and with the creation of the barrier islands this area has become what is now known as the Mississippi Sound.

The following description of the geological history of the Mississippi Sound is taken from Otvos (1981) as summarized by Bahr et al. (1983). The mainland shoreline of Mississippi is located on ancient beach ridges, the Gulfport Formation overlying the Biloxi Formation, that formed about 1.25 million years B.P., during the Sangomon interglacial period when sea level stood higher than at present. During the late Pleistocene period of sea level decline, river trenches were eroded into the prairie terrace in the Gulf of Mexico seaward of the location of the barrier islands. These entrenchments filled with sediments as sea level rose again in the late Wisconsin and early Holocene until sea level stabilized about 4,500 B.P. The bays along the Mississippi coast formed at this time, as sea water filled the coastal depressions, and most of the area now occupied by Mississippi Sound was a marine system as evidenced by the presence of marine foraminifera remains in sediment cores. The area around the mouth of the Pearl River and the nearshore area was brackish in nature. The barrier islands formed about 4,000 years B.P. from the accretion of bottom sediments that had originally eroded from the Alabama mainland. These islands formed a 230 km long barrier island-shoal chain that extended between Dauphin Island, Alabama and the present Jefferson Parish-New Orleans metropolitan area. Between 3,000 and 2,300 years B.P., St. Bernard delta sediments from the Mississippi River prograded into the gulf to about 3-20 km south of the Present Cat, Ship, and Horn Islands. The delta reduced wave energy from the west and stopped the progradation of Cat Island. After the Mississippi River abandoned the St. Bernard distributary, erosion of delta sediments led to severe erosion of the Mississippi coastal marshlands. The Chandeleur Island chain formed parallel to the original delta lobe shore and has since migrated westward.

The Mississippi Sound receives both high saline waters from the Gulf of Mexico and freshwater from the streams which drain some 20,000 square miles of land area. Major streams which contribute inflows are the Pascagoula River, the Pearl River, and to some degree the Mobile River. Gulf waters enter the Sound through the deep passes between the barrier islands with the help of tidal forces. This mixing of freshwater runoff and saline waters have created a dynamic estuarine environment.

The Gulfport area has a humid, warm-temperate to sub-tropical climate, although occasional subfreezing temperatures do occur Air temperatures are influenced by the Gulf of Mexico, with average annual temperatures ranging between 60oF to 70^{o}F. Summer temperatures are influenced by the Bermuda High, a semipermanent high-pressure cell that extends over portions of the Gulf of Mexico near 30^{o} N latitude. During the spring to early fall, anticyclonic winds generated by the high-pressure cell blow predominantly

from the southeastern sector and have a high moisture content which tends to keep coastal temperatures lower than those of inland areas.. During late fall and winter the winds are associated with frontal passages, causing resultant wind flow from the northern sector. Temperatures remain relatively mild, ranging from lows in the 40's to highs in the 60's (^{O}F). The normal annual rainfall within the study area is among the highest in the United States. Rainfall amounts average between 55 to 64 inches and is fairly evenly distributed over the year. Thunderstorm frequency is one of the highest in the United States. Relative humidity is fairly constant throughout both the day and the year and is usually highest between 2400 and 0600 hours (83%) and lowest between 1200 and 2000 hours (62%). Cloudiness tends to be highest in the winter and summer with lower values in the spring and fall. Much of the summer cloudiness consists of convective cumulus or high, thin clouds. Winter cloudiness is generally associated with movement of extra tropical cyclones and their associated frontal systems. Periods of low visibility from November through May correspond with heavy fog periods. Winter fogs are fairly frequent in the Gulfport area as the rivers and tributaries empty cold water into the warmer gulf waters. Heavy rains and high humidity during the summer are probably responsible for occasional low visibility.

A hurricane is a tropical cyclone with wind velocities of 74 mph or greater. Most hurricanes form in zones between 8^{O} and 15^{O} N latitude, where the sea surface temperature is high and the Coriolis force is strong enough to cause the spinning of winds around low-pressure centers. Hurricanes pose a definite threat to the Gulfport area from June through October, being most frequent during September. These late summer hurricanes tend to originate in the eastern North Atlantic near the Cape Verde Islands and are often severe. Those hurricanes arising in June and July usually originate in the western Atlantic or Caribbean and tend to be weak. The high winds typically generated by hurricanes are ordinarily not as destructive as the marked rise in water level, referred to as hurricane surge. Hurricane Camille is the last storm to have directly impacted the Gulfport area and almost completely destroyed the entire Mississippi Coast. This small but devastating storm came inland in the St. Louis Bay/Waveland area on August 17, 1969. Winds were estimated near 200 mph at the center of the hurricane with tides rising in excess of 22 feet. The probability of a tropical storm or hurricane affecting the area of Gulfport has been calculated as 13% for a tropical storm, 6% for a hurricane, and 1% for a severe hurricane each year.

Although wind direction tends to be variable throughout the year, the overall pattern is for northerly winds from September through February and southerly winds the remainder of the year. Throughout the year, wind speeds average 7-10 knots.

The Gulfport Harbor area is located in a densely developed area. Either side of the port facilities is man-made beach flanked by seawall. Behind the seawall are extensive commercial and residential developments. The major biotic communities within the area are the nearshore Gulf of Mexico, estuarine open waters, barrier islands, and urban areas. Commercial fisheries utilize the open water areas throughout their life cycles. A number of threatened or endangered species ranges overlap the study area.

4.2 Significant Resources.

4.2.1 **Vegetation.** Due to the developed nature of the area vegetation such as emergent wetlands or forested areas comprises very little of the habitats within the study area. The barrier islands support saline marsh development along their protected shores. The island marshes are typically divided into three zones. The high marsh occurs at elevations approximately 1 meter above MSL and is characterized by salt marsh fimbristylis (Fimbristylis castanea) and salt meadow cordgrass (Spartina patens). These areas are inundated only on highest tides and the plants are less salt tolerant than those in the other zones. The brackish and tidal zones are dominated by black needlerush (Juncus roemerianus) and spike rush (Eleocharis spp.) and smooth cordgrass (Spartina alterniflora), respectively (Eleuterius, L. 1973; U.S. Department of Interior 1978). There are approximately 258 acres of saline marshes on East and West Ship Island. Cat Island and the Chandeleur Islands are relatively natural with extensive marsh areas.

Some freshwater marsh habitat may be found on the inland portions of these islands. These habitats are characterized by sawgrass (Cladium jamaicense), arrow-head (Sagittaria spp.), alligator weed (Alternanthera philoxeroides), and cattails (Typha spp.). The higher portions of the islands support both beach-dune associations and maritime strand habitats. The land-water interface is characterized by beach conditions which support sea oats (Uniola paniculata), morning glory (Ipomoea spp.), and pennywort (Hydrocotyle bonariensis). The beach habitat intergrades into dune conditions vegetated by saw palmetto (Serenoa repens), seaside rosemary (Ceratiola ericoides), sea oats, morning glory, and pennywort. Upland vegetation found on the islands includes slash pine (Pinus elliottii) and wax myrtle (Myrica cerifera).

In this area of the Mississippi Sound submersed grass beds are restricted to the northern shores of the barrier islands. These areas are characterized by turtle grass (Thalassia testudinum), manatee grass (Cymodocea manatorum), shoal grass (Halodule wrightii), and widgeon grass (Ruppia maritima). Approximately 20,000 acres of submersed grassbeds were present in Mississippi Sound prior to 1969, however, in late 1969, Hurricane Camille caused the destruction of the majority of these areas (Eleuterius, L. 1973). Recent studies by the National Park Service indicate that small (less than 50 acres) patches of shoal grass are located within 1,500 feet of the shoreline of East and West Ship Islands (US Department of Interior, 1978). Extensive grassbeds are located on the western side of the Chandeleur Islands in Chandeleur Sound.

4.2.2 **Aquatic Resources.** Estuarine and Gulf open water areas dominate the delineated study area. These areas range in depth from less than 1-foot MLW to depths greater than 60 feet and contain a variety of resources important to the functioning of the ecosystem.

Intertidal and subtidal bottoms are populated by communities of macrofauna whose structure is dependent upon substrate, salinity, temperature, depth, and ecological relationships. Of the five benthic communities which have been identified within the study area, the open sound, muddy-sand community

occupies over 70% of the study area. Although there are no oyster reefs within the study area, the Square Handkerchief Shoal reef, the largest in Mississippi, is just west of the study area.

The major fisheries of the study area include menhaden, mullet, croakers, brown and white shrimp, blue crab, and oysters. Christmas and Waller (1973) reported 138 species of finfish taken from Mississippi Sound. The bay anchovy (Anchoa mitchilli) was the most abundant species, making up over 70% of the catch. Menhaden (Brevoortia patronus), Atlantic croaker (Micropogonias undulatus), and spot (Leiostomus xanthurus) were also abundant. Mississippi's reported commercial landings of finfish and shellfish averaged 357.8 million pounds with a dockside value of 36.7 million dollars. Most of the commercial fishing activity is located in the Pascagoula-Moss Point area, however finfish and shellfish are landed at Gulfport and Pass Christian and trucked elsewhere for processing. Harrison County is the leading shellfish producing area in the state, accounting for more than half of the landings of shrimp, blue crab, and oysters.

These species and others common to the area are estuarine dependent, i.e., they spend part or all of their lives in estuaries. A typical estuarine dependent species spawns in the Gulf of Mexico, and the larvae are then carried into the estuaries where they mature. The stage from the egg to juvenile, during which transport from offshore waters to low salinity areas is accomplished, is probably the most critical of all in the life histories of the important fishery organisms of the northern Gulf of Mexico. The threat to individuals during this time may be broken down into three distinct phases: (1) transport from the offshore waters to the vicinity of the tidal passes; (2) transport through the passes into the estuaries; and (3) distribution within the estuaries after entrance has been obtained (Gunter, 1967). Since these forms are typically incapable of sustained locomotion, any significant increase or decrease in flow through the barrier island pass could impact the migration of these forms.

The margins of Ship and Cat Islands, the Chandeleur Islands, and the grassbeds around these islands serve as the dominant nursery grounds during the spring and summer months. In autumn these areas are still important, but usage is not as heavy due to the seaward migration of many late juveniles (Benson, 1982 and USACE, 1984). Analysis of data by the U. S. Fish and Wildlife Service during the Mississippi Sound Study (USACE 1984) shows that Ship Island Pass does serve as an important migratory route between Lake Borgne and western Mississippi Sound and the Gulf of Mexico. Adult fish distribution is more heavily weighted toward the Lake Borgne/western Mississippi Sound area than in the vicinity of the Gulfport channel. The area seaward of West and East Ship Islands has been identified as a natural Spanish mackerel (Scomberomorus maculatus) congregation area (Bahr et al., 1983).

4.2.3 **Wildlife Resources.** Wildlife habitat consists of the open waters of Mississippi Sound and the Gulf of Mexico, and the wetland and upland areas of the barrier islands. The barrier islands provide habitat for a number of birds, some small mammals, and sea turtles. Many shorebirds and wading birds frequent the islands including herons, egrets, terns, gulls, and black

skimmers (Rynchops nigra). Tropical migrants such as warblers, grosbeaks, and tanagers are present on the islands during the spring and fall. The islands also provide nesting habitat for a number of wading and shorebirds. Cat Island has provided historic nesting habitat for least terns and in all probability this species still nests on the island. Black skimmers have historically nested on Ship Island. The Chandeleur Islands and Mississippi Delta provide extensive nesting habitat for a number of birds including laughing gulls (Larus atricillus), brown pelicans (Pelecanus occidentalis), great egrets (Casmerodius albus), snowy egrets (Egretta thula), tricolored herons (Hydranassa tricolor), black-crowned night heron (Nycticorox nycticorox), little blue herons (Florida caerulea), black skimmers, caspian terns (Hydroprogne caspia) and reddish egret (Dichromanassa rufescens) (Keller et al., 1984). Fifteen active osprey (Pandion haliaetus) nests have been identified on Ship Island (US. Department of Interior 1988).

Although extensively developed, the Harrison County shoreline houses five nesting colonies of least terns. Three of these colonies are located to the west of the Gulfport Harbor facilities, and two to the east.

Due to the distance between the mainland and the barrier islands, the mammal populations are limited to a few species including raccoon (Procyon lotor varius), nutria (Myocastor coypus bonariensis), and black rat (Rattus rattus). Mammals typically found in the Mississippi Sound and nearshore Gulf of Mexico include the Atlantic bottlenosed dolphin (Tursiops truncatus) and the Atlantic spotted dolphin (Stenella plagiodon). A number of whales are also known to occur offshore and occasionally within Mississippi Sound including the fin whale (Balaenoptera physalus), sperm whale (Physeter catodon), and the short-finned pilot whale (Globicephala macrorhynchus). A large baleen whale was reported beached on the north shore of Ship Island in the spring of 1967 (Christmas and Waller 1973). The Florida manatee (Tricheucus manatus latirostris) has been recorded from the estuarine waters of Mississippi on several occasions (Gunter 1954, Caldwell and Caldwell 1973, Gunter and Corcoran 1981).

Sea turtles are also known to regularly use the gulf waters near the barrier islands and may occur within Mississippi Sound. Five species, including the loggerhead (Caretta caretta), green turtle (Chelonia mydas), hawksbill (Eretmochelys imbricata), leatnerback (Dermochelys coriacea) and the Atlantic ridley (Lepidochelys kempi). Loggerhead turtles were reported nesting on Ship Island during the 1987 nesting season (T. Simons, Personal Communication).

4.2.4 **Endangered and Threatened Species.** The National Marine Fisheries Service indicated that a number of threatened and endangered species may occur off the coast of Mississippi including: the finback whale (Balaenoptera physalus), humpback whale (Megaptera novaeangliae), sei whale (B. borealis), green sea turtle (Chelonia mydas), Kemp's (Atlantic) ridley sea turtle (Lepidochelys kempi), leatherback sea turtle (Dermochelys coriacea), and the loggerhead sea turtle (Caretta caretta).

Finback whales are cosmopolitan and occur in all oceans. In the Gulf of Mexico this species is present throughout the year and sightings at sea have

been recorded in the northern Gulf between 28° and 30° N latitude and 86° and 88° W longitude. Strandings have been recorded along Florida, Texas, and Louisiana (Schmidly 1981). Humpback whales also occur in all oceans, however prior to 1981 the only recent record for the Gulf of Mexico was in April 1962 at the mouth of Tampa Bay (Layne 1965). Other sightings have been in deep water (>200 meters) off the Alabama/Florida coast. Sei whales strandings have been recorded from the coasts of Mississippi and Louisiana in the vicinity of the Mississippi River Delta (Schmidly 1981).

Although marine turtles occasionally enter estuaries (Behler and King 1979), they generally prefer higher salinity waters such as those of the Gulf of Mexico. Nesting may occur throughout the range but most nesting occurs on restricted areas of beach that the turtles return to each nesting season. Foraging areas are often very far from nesting beaches and in order to nest, turtles may migrate long distances. Mating generally takes place in offshore waters near the nesting beach and males rarely come ashore (Fuller 1978).

Green turtles are most abundant between 35° north and 35° south latitudes, particularly in the Caribbean. Immature turtles are found along the Florida west coast (Carr and Caldwell, 1956) and adults have been known to nest on the barrier islands of the northern Gulf coast in the past.

Only a small portion of loggerhead nesting occurs in the Gulf. About 90 percent of the total nesting effort in the United States occurs on the south Atlantic coast of Florida (Carr and Carr 1977). Christmas and Waller (1973) reported loggerhead nestings on the beaches of the Mississippi Sound barrier islands. Ogren (1977) stated that historically the loggerhead nested on the remote beaches of Cat, Ship, Horn, Petit Bois, and Dauphin Islands. Human disturbance, natural predation, and island development have reduced the use of the barrier islands for nestings. Normally 1 to 2 loggerhead crawls are noted on the Mississippi barrier islands each year. One nesting attempt was noted on June 7, 1987, on east Ship Island which represents the only confirmed nesting attempt on the Mississippi Islands in the last four years (T. Simons personal communication).

The leatherback is probably the most oceanic of all sea turtles, preferring deep waters (Rebel 1974). It occasionally enters shallow waters and estuaries usually in the more northern waters of it's range (Barbour 1972). Leatherbacks are frequently seen in the Gulf of Mexico and are seasonally abundant off the Florida coast near Panama City (Pritchard 1976).

Kemp's ridley sea turtles are probably the most endangered of the sea turtles in the Gulf of Mexico. Their nesting is restricted to a small stretch of beach near Rancho Nuevo, Ramaulipas, Mexico. Immature ridley's are regularly encountered (strandings) in the Mississippi Sound and adjacent to the barrier islands (R. Smith, National Park Service). Ogren (personal communication) indicated that this species tends to congregate in shallow water vegetated areas within the estuaries.

The U. S. Fish and Wildlife Service indicated that a number of threatened and endangered species under it's jurisdiction could occur within the

the Gulfport area including the Florida manatee (Trichecus manatus), the Florida Panther (Felis concolor), the bald eagle (Haliaeetus leucocephalus), peregrine falcon (Falco peregrinus), brown pelican (Pelecanus occidentalis), Bachmann's warbler (Vermivora bachmanii), ivory-billed woodpecker (Campephilus principalis), red-cockaded woodpecker (Picoides dentrocopos borealis), American alligator (Alligator mississippiensis), and the eastern indigo snake (Drymarchon corais couperi).

As discussed in Section 4.2.3 above, the Florida manatee has been recorded from the estuarine waters of Mississippi. Manatees occur along the coast and in coastal rivers of the southeastern United States from North Carolina southward to southern Florida and westward in the Gulf of Mexico to southern Texas and Veracruz, thence through the West Indies and Caribbean waters of Central America to northern South America. The species is intolerant of low temperatures, and even in Florida its numbers are often seriously reduced as a consequence of occasional spells of cold weather (Lowery 1974). Since the species is restricted to warmer waters, it was surmised that the manatees recorded from the Mississippi area wandered westward from Florida waters (Gunter and Corcoran 1981).

The Florida Panther formerly occurred from northern British Columbia across southern Canada to New Brunswick and Nova Scotia and south to Patagonia at the southern extremity of South America (Lowery 1974). Preferred habitat of the cougar is riverine swamps and it may still occur in the lower Pearl River Delta of Louisiana and Mississippi.

Bachmann's warbler is probably the rarest of North American songbirds and may be close to extinction. It inhabits the borders of swamps, especially where the forest crown is open and blackberry bushes are frequent. The species breeds usually in the upper part of the Coastal Plain and in the Mississippi Valley from southern Indiana and eastern Missouri south to Louisiana, east through the Gulf states, and north to coastal Virginia. Because it frequently moves its nesting locality, has secretive habits, lacks a distinctive song, and generally frequents places of difficult access, the species may go undetected. It is known to migrate through the Florida Keys, occasionally also the Bahamas, to winter in western Cuba, the Isle of Pines, and rarely Mississippi, Georgia, and Florida (Imhof 1976). The Ivory-billed woodpecker may also be extinct. This species inhabited virgin bottomland hardwood forests and as these woodlands were exploited, the bird, apparently unable to adapt itself, steadily retreated. It was last reported in Alabama in 1907, in Louisiana in 1940, and in Florida in 1950. The red-cockaded woodpecker is a local permanent resident of piney woods in the southern part of the state. It usually lives and nests in woods in which about one-quarter or more of the trees are pines. For nesting this species requires a mature pine with a dead heart. This species ranges from eastern Oklahoma, Kentucky, and southern Maryland south to eastern Texas and southern Florida (Imhof 1976).

Prior to 1957, the brown pelican was a common breeding resident of the Mississippi Gulf Coast. Between 1957 and 1959, the brown pelican population along the entire Gulf Coast was virtually wiped out. Evidence points to DDT and other pesticides which concentrated in the pelican's aquatic food

source. Since 1973, the species appears to have made a comeback, particularly along the southeast Atlantic coast, Florida and Alabama. The pelican breeds in colonies on lonely shores and isolated islands along the Pacific Coast from California to Chile, wintering north to British Columbia, and along the Atlantic, Gulf, and Caribbean coasts from North Carolina to Guyana, wintering north to North Carolina (Imhof 1976).

The bald eagle was a locally common, breeding, winter resident on the Gulf Coast. About 1960 the breeding population began to dwindle much like the pelican. The bald eagle uses sticks to build a hugh nest at the top of a tall tree, usually a live one, close to the water. The species is resident from northwestern Alaska, northern Mackenzie, and Labrador south to southern Lower California, northern Mexico, and Florida. It breeds locally throughout this range in favorable localities such as coastal Alaska, the upper Mississippi Valley, the Great Lakes, Chesapeake Bay, and the Gulf coast, but is absent from arid regions (Imhof 1976). A bald eagle hacking program was initiated by the National Park Service in the winter of 1985 on Horn Island, east of Gulfport. The intent of this program is to try to reestablish populations along the coastal regions, however it will be several years before the success of this effort is known (US Department of Interior 1988). The peregrine falcon is present on the Mississippi Gulf coast during migration, especially in the fall. Preferred nesting site is a tall cliff near water, but it may occur in a variety of places near water.

The Eastern indigo snake has probably suffered more from the effects of civilization than any other southeastern snake (Mount 1975). It is a large conspicuous slow-moving snake which prefers open desolate areas in conjunction with gopher tortoise burrows. Recently, the species has been introduced into coastal Alabama by Auburn University in hopes of reestablishing its population. The Mississippi alligator population had been steadily declining throughout it range because of excessive hunting and poaching. However, as a result of protective measures their numbers have increased all along the Gulf coast and in September 1988, a controlled hunt was allowed in Florida. Alligators prefer swamps, lakes, sloughs, and sluggish streams but are also common in bayous and smaller streams that drain into the estuaries.

4.2.5 **Air Quality.** Air quality of the Harrison County coastal area is considered good. Cloudiness tends to be highest in the winter and summer with lower values in the spring and fall. Much of the summer cloudiness consists of convective cumulus or high, thin clouds. Winter cloudiness is generally associated with movement of extra tropical cyclones and their associated frontal systems. Periods of low visibility from November through May correspond with heavy fog periods. Winter fogs are fairly frequent along the gulf coast as the larger rivers and tributaries empty cold water into the warmer gulf waters. Heavy rains and high humidity during the summer are probably responsible for occasional low visibility.

4.2.6 **Water Quality.** Water quality of western Mississippi Sound including the Gulfport area is good. With the exception of areas immediately adjacent to the shoreline and along the navigation channel, which are classified for recreational use, the sound is classified as recreational waters and for

shellfish harvest.

Dissolved oxygen concentrations within the sound typically vary between 7 mg/l to 12 mg/l (saturation) during the spring, and between 6 mg/l to 12 mg/l during the summer, reflecting dilution of the various oxygen demanding wastes entering the sound. Nutrient values are highly variable, both temporally and spatially, in response to freshwater inflow and seasonal factors. pH values tend to be highest in winter and lowest in late summer and early fall. Nitrite-nitrogen is lowest in winter and summer with maxima occurring in the spring while nitrate-nitrogen is highest in winter and spring with summer and fall levels being much lower. Orthophosphate tends to be highest in spring and summer with a pronounced east to west decline in concentrations. Orthophosphates reach highest levels during spring and summer while total phosphates reached highest concentrations (Eleuterius 1979).

Salinity values within the study area are highly variable. During spring high freshwater inflow periods, salinities vary between 1 and 20 parts per thousand (ppt) with a general decreasing trend from east to west in Mississippi Sound. The summer lower inflow period can range between 5 to 29 ppt exhibiting the same decreasing trend as the spring. The system is well-mixed throughout the water column except within the navigation channels and barrier island passes (Kjerfve 1983). Salinities in the nearshore Gulf of Mexico are more oceanic in nature ranging around 20 to 35 ppt with stratification being temporarily variable.

Dissolved oxygen (DO) concentrations in the nearshore Gulf of Mexico have been shown to exhibit some seasonal variation with low DO values prevalent during summer months. These low values are attributed to stratification and isolation of bottom waters from surface waters, turbidity, and organic loading (Turner and Allen 1982). Hydrographic studies performed during January and June, 1980, in the vicinity of the Gulfport ocean disposal sites indicated minor stratification. Surface DO levels ranged from 4.94 to 5.33 ml/l in January and 4.21 to 5.58 ml/l in June while bottom DO level ranged from 5.17 to 5.33 ml/l in January and 2.10 to 2.23 ml/l in June (EPA 1986). Mean annual DO concentrations range from 6 to 9 ppm throughout the region (Barry A. Vittor & Associates, Inc., 1985).

Analysis of selected metals, nutrients, and organics from waters in the vicinity of the ocean disposal sites at Gulfport in 1980 resulted in trace levels which were lower than those reported for the Mississippi Delta Region (Dames and Moore 1979). Pesticide concentrations were below detectable levels, however PCBs were detected during January and ranged from 0.0008 to 0.0014 ng/l (EPA 1986). These concentrations are comparable to those reported for the northeastern Gulf Shelf waters (Rinkel and Jones 1973).

4.2.7 **Circulation.** Freshwater discharge into this area of Mississippi Sound is primarily from the Pearl River and averages approximately 12,800 cfs. The Pearl River receives drainage from a basin of approximately 8,700 square miles. In addition freshwater from the Mississippi River may enter Mississippi Sound during flood conditions via Bonnet Carre Spillway into Lake Pontchartrain & Lake Borgne. Since it's construction in 1927, the

spillway has operated on seven occasions, 1937, 1945, 1950, 1973, 1975, 1979, and 1983. During these periods the floodway was in operation for between 13 to 75 days with average discharge of approximately 141,000 cfs.

Circulation patterns within the study area are controlled by astronomical tides, winds, and, to a lesser degree, freshwater discharge. In Mississippi Sound and adjacent gulf waters the tidal variation is diurnal with an average period of 24.8 hours. The tidal wave progresses from south to north and enters the sound first through Horn Island Pass near Pascagoula, Mississippi and splits, traveling both eastward and westward causing as much as a 6-hour phase shift within Mississippi Sound. The eastward progressing high water reaches Pass aux Herons approximately one hour after entering the sound. On the flood tide, water enters through Petit Bois Pass and is deflected eastward toward Mobile Bay. On the ebb tide, water residing in eastern Mississippi Sound flows south-west through the Pass. In addition some water from Mobile Bay moves through Pass aux Herons into eastern Mississippi Sound.

The effect of the wind on circulation in this area is significant. The superimposed wind-induced current shifts the bifurcation area at Horn Island Pass either toward the east or west depending on the east/west wind component and whether the tide is ebbing or flooding. A wind with an eastern component induces a general westward current in the sound causing the bifurcation area to shift to the east (Petit Bois Pass) during the flood tide and to the west (Dog Keys Pass) on the ebb. Winds with a western component set up a general eastward circulation pattern in the sound. Winds with dominant north and south components have minimal effect on the overall circulation pattern, however may have significant localized effects. These wind components cause the development of eddies within the shallower areas of the sound tending to disrupt and diffuse tidal currents. These eddies have been shown to be strongest in the eastern half of the sound including the study area.

Winds with strong north or south components have a significant effect on water surface elevation within Mississippi Sound. Northerly winds tend to depress water levels while southerly winds raise water levels. Schroeder and Wiseman (1985) analyzed wind (1974-1984) and sea level elevations (1973-1983) in coastal Alabama and found that the passage of winter cold fronts (also called northers) during October through March could cause significant perturbations in sea level. Huh et al. (1984) (in Schroeder and Wiseman, 1985) noted that the winter cold front storms occurred in a three phase cycle: prefrontal, frontal passage, and cold-air outbreak/high pressure. The prefrontal phase is characterized by falling barometric pressure, strengthening of southerly winds, and warm, moist air conditions. The frontal passage involves an abrupt reversal of these conditions, accompanied by a squall line passage, strong wind shear, precipitation, and a rapid drop in air temperature. During the cold-air outbreak/high-pressure phase, pressure rises rapidly and strong winds rotate from northwest to northeast. Seas and sea level, set up by the prefrontal southerly winds and falling atmospheric pressure, are set down by the strong northerly winds and rising pressure. Differences in sea level elevation between prefrontal set up and post-frontal set down are commonly 2.5 to 3.0 feet and occur over periods of

12 to 24 hours.

Water velocities range between 0 to 3 feet per second (fps) in the barrier island passes and between 0 to 0.8 fps in the sound. The region west of Biloxi and east of Petit Bois Pass have the higher velocities while velocities near the Pascagoula area are the lowest. Generally, peak velocities throughout the sound will increase by 40 percent per one foot increase in the tidal range. East/west wind components tend to increase velocities in the sound between Biloxi, Mississippi and Mobile Bay. North/south wind components have small, localized, erratic effects on water velocities.

Within the Gulf, south of the barrier islands to the 120-foot depth contour, meteorological forcing results from (1) the daily, land-sea breeze cycle and associated small pressure changes, and (2) the passage of fronts. The dominant force to the system results from the passage of fronts. Dimego et al. (1976) in Kjerfve (1984) report that roughly 8 frontal passages per month can be expected within the Gulf between November and January (winter), 6 frontal passages per month between March and May (spring), and 2 weak, slow-moving frontal passages per month between July and September (summer). During the winter, the fronts are highly energetic with respect to wind and atmospheric pressure due to the sharp contrast between the adjoining air masses and the passage of pressure system centers through the region. The spring fronts are still highly energetic but the typical ground track of their low pressure centers is slightly north of the region. The summer frontal passages are less frequent, traveling along paths well north of the region and exerting very little influence within the Gulf.

Wave intensity on the Mississippi-Alabama shelf is low to moderate with wave periods ranging from three to eight seconds and wave heights rarely over 7 feet. Hurricane or storm conditions, however, may produce larger waves. The region of the Gulf of Mexico offshore in the project area is characterized by transient net currents that are largely driven by wind forcing. The diurnal tide in this area is much less pronounced than most other shelf regions of United States, but is the most obvious source of variation in water level and is the driving force of the oscillatory currents on inner shelf. As in Mississippi Sound the tide in this area is defined as microtidal. This area of the northern Gulf of Mexico is bounded by the barrier islands, Cat and Ship, on the north and the Chandeleur Islands and the shallow waters of Chandeleur Sound on the west and southwest.

4.2.8 **Sediment Quality.** Soils in the harbor area contain soft black and gray clays of high plasticity, firm gray clayey sand, firm silty clay, and poorly graded medium to fine grained sand. A majority of the material within the turning basin, just outside of the harbor proper, consists of firm clays, clay-sands, and sands. The material down to elevation -40 MLLW (Mean Lower Low Water) is suitable for construction fill. The predominant soils encountered in the Mississippi Sound channel segment are plastic clays, poorly graded sands, and silty sands. Occasional pockets of clayey sands and silty clays are also present. From the harbor area to the region of the Gulf Intracoastal Waterway, typically there are six to eight feet of

clay overlying the sandy soils, although along some stretches of the channel no sand is found down to -40 MLLW. Near Ship Island, the upper level sediments are composed almost entirely of sand and silty sand. Both fine grained soils such as plastic clays, clayey silty sands, and silts and sandy soils are found in the Ship Island Pass segment. Most of the clay material in this area is very soft or soft. In the Gulf Channel, the soils consist almost entirely of soft gray plastic clay.

Past chemical studies of sediments from western Mississippi Sound and the Gulfport area indicated relatively low concentrations of nutrients, total organic carbon, heavy metals, pesticides, phenols, and hydrocarbons (Walker 1976, O'Brien 1980, Lytle and Lytle 1985). Toxicity and bioaccumulation studies were performed by the Environmental Protection Agency in 1988. Results of these studies indicated that the toxicity of the sediments tested was minimal. Survival in 100% suspended solid phase (SSP) of the sediments was greater than 80% and not significantly different from SSP prepared with reference sediments. Exposure to the sediments for 10 days had little observable adverse effect on oysters (Crassostrea virginica) or pink shrimp (Penaeus duorarum). Survival of oysters was 96% in the reference sediment and 90% in sediments from the project area. Shrimp survival was 100% in the reference sediment and $\geq$ 94% in site sediments. Survival of lugworms (Arenicola cristata) exposed to sediments from sites 2 and 3 was not significantly different to survival in reference sediments. Survival of lugworms exposed to sediment from the northernmost sampling location (Site 1), however, was significantly different from survival in reference sediments.

Chemical analyses performed on sediments and on tissues from the organisms utilized in the toxicity tests revealed no residues of pesticides or PCBs in either the sediments or the tissues before or after exposure. Residues of several heavy metals were detected in sediments and in tissues of organisms before and after exposure. Using analysis of variance at the 0.05 probability level, concentrations of metals in oysters and lugworms exposed to project sediments were not significantly greater than concentrations of metals in animals exposed to a reference sediment. Although statistically significant differences were determined for selenium and zinc in shrimp, appropriate consideration should be given to the magnitude of these numbers. (For more detail refer to Appendix D).

4.2.9 **Groundwater Resources.** Within coastal Mississippi, many different sands of Miocene, Pliocene, Pleistocene and recent age contain fresh water. Formations in the freshwater sections in ascending order are the Pascagoula, Graham Ferry, and Citronelle. Overlying these deposits in many areas are terrace deposits and alluvium. There are no thick, consistent, traceable sand beds within this segment of the study area. Formations in the freshwater sections dip towards the south in Jackson County and to the southwest in Hancock County, being deeper in southwest Hancock County than in north Jackson County. The base of the freshwater zone varies from less than 1,500 feet to more than 2,500 feet below sea level in Harrison County. Harrison County uses more than 50 MGD from ground water sources for municipal and industrial purposes. Groundwater levels in artesian aquifers statewide continue long-term declining trends. Generally, in wells screened

in the Miocene aquifers in southern Mississippi, water levels declined about 1 foot between water year 1982 to 1983. During this same time, well levels in the Graham Ferry Formation declined approximately 2 feet. The shallow Citronelle aquifer showed slightly higher water levels (Tate et al. 1985). Groundwater quality is generally good. Dissolved solids concentrations are variable and generally increase with depth. Some concentrations are low. Groundwater quality in the Gulfport area is good. However, some wells in Jackson County, in particular the Moss Point-Pascagoula area, produce water approaching or slightly exceeding the maximum allowable concentration of 1.2 mg/l for fluoride and chloride concentrations in water from the Pascagoula Formation in this area have steadily increased over the years (Baughman et al. 1976). Increase in chloride concentration is an indicator of saltwater encroachment in the area, resulting from heavy withdrawals. In 1982, the Mississippi Bureau of Pollution Control identified the Pascagoula, Moss Point, and Biloxi areas as having problems resulting from overpumping. Although groundwater resources in the Gulfport area are not of great concern, recent information indicates that saturation levels have been reached with respect to pumping and current efforts are being expended to locate wells in the western portion of the area to spread out pumping requirements (James Spencer, Personal Communication 1988).

4.2.10 **Land Resource and Use.** Gulfport Harbor is a manmade facility south of the seawall separating Mississippi Sound and the Harrison County mainland. The Harrison County shoreline from Biloxi Bay to St Louis Bay is highly developed, comprised of the cities of Biloxi, Gulfport, Long Beach, and Pass Christian. The Gulfport city limits extend approximately nine miles in an east-west direction from the Biloxi city Limits on the east to the Long Beach city limits on the west. The Harrison County Industrial Seaway forms much of the northern boundary of the city.

The barrier islands of the northern Gulf of Mexico are in an erosion/deposition cycle which results in the westward migration of the islands through time. The historical formation of the St. Bernard subdelta of the Mississippi River in the area south of Cat, Ship, and Horn Islands served to reduce wave energy from the west and stopped the progradation of Cat Island. After the Mississippi River abandoned the St. Bernard distributary, erosion of delta sediments led to severe erosion of the Mississippi coastal marshlands. The Chandeleur Island chain which was formed parallel to the original delta lobe shore and has since migrated westward and is currently experiencing erosion and some subsidence. In 1969 Ship Island was breached during Hurricane Camille and the two islands have remained distinct since.

Cat Island is within the Coastal Barrier Resources System (CBRS) as established by the Coastal Barriers Resources Act (CBRA) of 1982 (P.L. 97-348). Under CBRA, no new expenditures or new financial assistance may be made available under authority of any Federal law for any purpose within the CBRS, except as provided in Section 6 of the Act. Expenditures or financial assistance made available under authority of any Federal law shall be new if:

(1) in any case with respect to which specific appropriations are

required, no money for construction or purchase purposes was appropriated before the date of the enactment of this Act; or

(2) no legally binding commitment for the expenditure or financial assistance was made before such date of enactment.

Under Section 6, the appropriate Federal offices, after consultation with the Department of Interior, may make Federal expenditures or financial assistance available within units of the CBRS if the proposed action falls within the following exceptions:

(1) facilities necessary for energy exploration and development
(2) ship channel maintenance and dredge disposal
(3) maintenance of highways
(4) military activities essential to national defense
(5) Coast Guard facilities
(6) Activities permitted, if compatible with the purposes of the CBRA, including:
    (a) management of fish, wildlife, and their habitat
    (b) establishment of air and water navigation devices
    (c) projects under the Land and Water Conservation Act and Coastal Zone Management Act
    (d) scientific research
    (e) emergency actions related to disaster relief
    (f) maintenance of roads not a part of an essential system
    (g) non-structural projects for shoreline stabilization.

4.2.11 **Mineral Exploration and Production.** Currently there are no mineral exploration or production activities ongoing in the immediate vicinity of the Gulfport Channel in Mississippi Sound. Chevron has a permit for an exploratory gas well in Mississippi Sound in the vicinity of the western end of Cat Island. Active lease areas in the Gulf of Mexico are located southeast of the project area in areas greater than 3 miles from the barrier island shorelines.

4.2.12 **Demography.** The three coastal counties have grown three times as fast as the state as a whole (US Department of Commerce 1952, 1967, 1977, 1983b). Jackson County has grown the fastest, almost twice the rate of growth of Harrison County and almost triple the rate of Hancock County. Commercial and industrial development and coastal amenities (beaches/recreational) have been the major strengths and attractiveness of the coastal counties.

The housing stock of the coastal counties has increased 209 percent from 1960 to 1980, which is a 40 percent faster housing stock increase than the State of Mississippi (US Department of Commerce 1980). Housing occupancy rates in the three coastal counties was about 91 percent during this period. There are mainly two reasons for the housing stock to increase faster than population growth: 1) gradually decreasing family sizes, and 2) increasing numbers of single person households.

4.2.13 **Economy.** Harrison County enjoys the greatest per capita income of

the three coastal counties (U S Department of Commerce 1983a). This income is earned mainly from wholesale/retail trade, government and professional employment. Jackson County has the second highest per capita income which is mainly from Ingalls Shipbuilding and large industrial employers in the Bayou Casotte Industrial Complex. Although the per capita income of Jackson and Harrison counties is greater than that of the state, both are 20 and 25 percent, respectively, less than the per capita income of the region and country.

Approximately 93 percent of the commerce moving through the Port of Gulfport during the period between 1980-1986 is export or import trade, with imports 53 percent greater than exports. The remaining 7 percent consists of coast-wide domestic shipments. The seven year average for commerce amounted to 1,239,015 tons. The principal foreign products moving in deep draft vessels include imported containerized fresh and canned fruits with a backhaul of paper and paperboard, dually imported ilmenite ore and containers with a backhaul of containers; and exported and imported miscellaneous products in containers. In 1986 approximately 50 percent of the tonnage through the port was containerized. For more information on the operations of the Port of Gulfport refer to Appendix A to the General Design Memorandum entitled "Economic Analysis".

4.2.14 **Community Cohesion.** Two very generalized types of cohesion are exhibited by the citizens of the Gulfport area. The first is a traditional type, based on long and cherished friendships, kinship ties, religious ties, and a sense of community developed out of many years of close interaction and interdependence. The second is much less important and is a more formalized economic type of cohesion.

4.2.15 **Recreational Opportunities.** The Mississippi Gulf Coast and the shoreline of Harrison County in particular offers a diversity of recreational and cultural activities including fishing, boating, and beach activities. Harrison County has recently undertaken an extensive nourishment project for the beaches and has prepared a development plan to provide for beach and parking facilities to enhance the recreational use of the shoreline (Harrison County 1986). The Bert Jones Yacht Basin is located immediately adjacent to the Port facility on the east and the Gulfport Small Craft Harbor is on the west. These facilities provide for commercial and recreational boating activities. In addition to these facilities, numerous marinas are located in the Biloxi and Bay St. Louis areas.

4.2.16 **Noise.** Noise problems are those associated with day-to-day activities, such as vehicular traffic, marine traffic, and ship loading and unloading activities. US Highway 90, which separates the port and beach areas from the residential and commercial areas to the north is a major source of noise.

4.2.17 **Aesthetics.** The aesthetic appeal of the Gulfport area is generally good. Sand beach areas extend for a number of miles on either side of the port facility. The area to the north of the port is characteristic of a commercial area. Residential areas extend on either side of the commercial development. Many of the homes facing the Mississippi Sound are set back on

large lots with large oak trees scattered through the lawn.

4.2.18 **Transportation.** U. S. Highway 90 forms the northern boundary of the port facility and extends from Florida to California. Interstate Highway 10, a major east-west artery is north of the City of Gulfport. U. S. Highway 49 runs northward from Gulfport to Jackson, MS. The Gulfport Municipal Airport is located to the north of the Port. Gulfport is approximately 73 miles west and east of Mobile, AL and New Orleans, LA, respectively. Both of these cities are served by major airline companies. The Gulfport Harbor area is served by the Seaboard System and the ICG Railroad.

4.2.19 **Public Facilities and Services.** Mississippi Power Company provides electricity to the study area from their Jack Watson Generating Plant north of the city. Water and sewer are provided by the City of Gulfport Water Department and natural gas is supplied by Entex.

4.2.20 **Cultural Resources.** Considering the age of many cities along the northern Gulf coast, Gulfport is a relative newcomer, not being incorporated until 1899. The origins of the city are linked to the vast timber resources of late 19th century coastal Mississippi, the development of the railroad, and the unique natural harbor present at Ship Island (Mistovich 1987). A number of National Register of Historic Places (NRHP) sites are located in the study area including: the 85 acre Fort Massachusetts Historic District and the 15 acre Ship Island Lighthouse District, administered by the National Park Service and the 26 acre Harbor Square Historic District which represents the city's original business district. In addition the U. S. Post Office and Courthouse, completed in 1910, the Hewes Building, and the Milner House are NRHP listings.

In 1987 documentary research was conducted to determine the potential for submerged historic properties in the vicinity of the Gulfport Channel. As a result of this study it was determined that with the exception of the channel in the vicinity of Ship Island, there was little potential for submerged historic properties along the remainder of the channel. Nine shipwrecks were identified for the Ship and Cat Islands vicinity at this time (Mistovich 1987). An underwater remote sensing survey was completed in 1988 (USACE 1988) to insure that significant submerged historic properties were evaluated. A total of one hundred and eighteen magnetic anomalies were recorded of which 20 appeared to warrant further evaluation. Three of these anomalies lie along alignment A, 6 on alignment B, 3 on alignment BB, 3 on alignment C, and 5 on alignment D. In November, 1988, underwater archeological investigations were conducted to determine the cultural significance of five magnetic anomalies. Three of the anomalies (A-1-1, A-2-8, and A-3-7) were located on channel alignment A. Anomalies BB-1-1 and C-1-6 were located at the intersections of alternate channels BB and C with channel alignment A. None of these targets proved to represent culturally significant materials. The Mississippi State Historic Preservation Officer has agreed that no further cultural resources investigations are required for the Gulfport Harbor project. The report describing cultural investigations is included in Appendix D of the General Design Memorandum.

5.0 ENVIRONMENTAL EFFECTS.

5.1 **Vegetation.** No adverse impacts to vegetation occur with the "No Action" and no adverse impacts would occur with implementation of any of the plans. Mitigation of the proposed port expansion area by the Port of Gulfport could enhance vegetated habitats in the area of western Mississippi Sound. Options which have been suggested include:

a) restoration of disturbed wetland areas in the Back Bay Biloxi/Bay St. Louis areas;

b) creation of wetland areas in the Back Bay Biloxi/Bay St. Louis areas; and

c) enhancement of disturbed areas in the Back Bay Biloxi/Bay St. Louis areas. The proposed mitigation options are discussed in more detail in Section 6 "Summary of Mitigation Measures".

5.2 **Aquatic Resources.**

5.2.1 "No Action" Alternative. Maintenance of the existing project under the "No Action" alternative requires the disposal of approximately 3.3 million cubic yards of material dredged from the anchorage area, Mississippi Sound, and Ship Island Pass channels every 18 months by pipeline dredge. Approximately 4,500 acres, in 10 sites located on both sides of the channel, in Mississippi Sound and a 60 acre beach nourishment area at Fort Massachusetts could be impacted during a maintenance cycle (Figure EIS-7). These areas range in depth from approximately 4.5 feet (northeast portion of area 1) to over 19 feet MLW (area 10). A portion of area 1 is characterized as shallow (coastal margin) mud habitat, areas 2 through 9 are characterized as deep (open sound) muddy sand habitat, and area 10 is characterized as clean sand (tidal pass/shallow sound) habitat. The macroinfaunal resources of the channel bottoms would continue to be disrupted on an 18 month frequency. In addition, the resources of the open water disposal areas would be covered with approximately 1-foot of dredged material. Although many of the organisms would be smothered, some would be able to migrate through this material. Other forms would migrate into the area or settle as larvae from the overlying water column. Studies performed at Gulfport indicate that repopulation was very rapid and that any transitory decrease or loss in population due to dredging and disposal was completely offset within six weeks (WAR 1975). Use of area 10, located in Ship Island Pass, would not have significant impacts to the benthic community since the organisms living in these areas are adapted to the highly variable physical conditions caused by waves and sediment transport. Use of the beach nourishment site at Fort Massachusetts would disrupt the intertidal communities along this section of shoreline of West Ship Island. These impacts would be similar to the use of area 10. In addition to the Mississippi Sound sites, approximately 400,000 cubic yards of material would continue to be disposed in the two EPA designated ocean disposal sites on an annual basis. These sites are characterized as offshore mud bottom habitat. The impacts associated with the disposal into these sites has been evaluated by the Environmental Protection Agency (1986) and that information is incorporated into this EIS by reference.

Motile aquatic resources such as shrimp, crabs and fish would tend to avoid

the area where dredging and disposal operations were ongoing. Larval and young age class aquatic organisms may become entrained during the dredging and disposal process due to their limited motility. The degree of these impacts would vary with the location and temporal setting of the operations. Impacts would be expected to be most severe in the spring in the area of Ship Island Pass which is probably utilized as a migratory route. The overall impacts to the fishery resources of Mississippi Sound however, are unknown. No oyster resources are impacted under the "No Action" alternative.

5.2.2 Impacts Common to All Plans Considered in Detail. Expansion of the Port facility through the addition of 29 acres on the west side as shown on Figure EIS-3 is common to all plans considered in detail, including the "No Action" alternative. Twenty-nine acres of shallow subtidal habitat ranging in depth from to approximately - 9 feet in depth would be filled to an elevation of + 10 feet MSL. In order to mitigate for the impacts associated with this action, a number of options have been designed by an interagency committee at the request of the port authority. These mitigation options are discussed in more detail in Section 6 "Summary of Mitigation Measures". Mitigation will be undertaken by the port authority as a condition of the Section 404 permit issued by the Department of Army, Corps of Engineers.

Use of the beach nourishment area at Fort Massachusetts on West Ship Island is common to all plans considered in detail. The impacts associated with this alternative would be the same as for the "No Action" alternative and would be temporary and not significant to aquatic resources.

Use of the littoral zone disposal area east of Cat Island would have minor short duration impacts on aquatic resources. The aquatic organisms utilizing this area are adapted to wave induced sedimentation and littoral sediment transport and the disposal impacts should be similar to the natural sedimentary processes of the area. Although the possibility exists that some mounding of materials may occur with this disposal option, the wave climate on the Gulf shore of the barrier islands is such that this should not pose significant impacts to the resources of Cat Island.

The relocation of the pipeline is required for all plans considered in detail. Since the pipeline would be deepened only in the vicinity of the realigned channel, along the current pipeline alignment, only very minor disturbance of the bottom would occur and resultant impacts to aquatic resources would be insignificant.

Removal of the timber and stone breakwater would result in the removal of firm substrate and attached epifaunal organisms. This impact is not considered significant since a greater amount of this habitat would be added to the system via the bank protection for the port expansion area. Epifaunal organisms such as barnacles and oysters would colonize the new firm substrate immediately after it's placement in Mississippi Sound.

Motile aquatic resources such as shrimp, crabs and fish would tend to avoid the area where dredging and disposal operations were ongoing. Larval and young age class aquatic organisms may become entrained during the dredging

and disposal process due to their limited motility. The degree of these impacts would vary with the location and temporal setting of the operations. Impacts would be expected to be most severe in the spring in the area of Ship Island Pass which is probably utilized as a migratory route. The overall impacts to the fishery resources of Mississippi Sound however, are unknown. No oyster resources would be impacted with any alternative plans considered in detail.

5.2.3 Plans A and C. Deepening the channel in Mississippi Sound by 6 feet with the implementation of Plans A and C would result in the conversion of approximately 57 acres of bottoms alongside the channel in Mississippi Sound from the current depths of 8 to 16 feet to depths ranging from 38 feet to 8 feet. This 'widening' is due to the adjusted side slopes from the deepening. Approximately 55 acres in the Gulf of Mexico would be similarly deepened from the existing depth of 22 to 36 feet to 38 to 22 feet. Organisms representative of the deep open sound and offshore mud habitats would colonize the channel and it's side slopes so no change in benthic communities is expected. These areas would be disturbed on an 18 month basis as with the "No Action" alternative.

Realignment of the entrance channel would result in the conversion of approximately 160 acres of hard sand bottoms from the existing 12 to 18 feet and 100 acres of hard sand bottoms ranging from 18 to 22 feet to depths ranging to 38 feet. Organisms in this area are adapted to the physical rigors of the tidal pass inlet and are similar to organisms occupying greater depths in the inlet, therefore the impacts associated with this conversion are not considered significant. This area would be disturbed on an 18 month basis during maintenance dredging; however, repopulation would return the area to normal levels between maintenance cycles. The existing channel through Ship Island Pass would be allowed to fill in; therefore, with time the total change to the habitat within Ship Island Pass would be negligible.

Implementation of Plan A would result in the disposal of approximately 12 million cubic yards of new work material in the two EPA designated ocean disposal sites at Gulfport. These areas represent a total of approximately 5500 acres of offshore mud bottoms. The impacts associated with the disposal into these sites has been evaluated by the Environmental Protection Agency (1986) and that information is incorporated into this EIS by reference. In their evaluation, concern was raised relative to the quantity of material which might be placed in these sites. These impacts are addressed in Section 5.7 of this EIS. In addition, approximately 4 million cubic yards of maintenance material would be placed in these sites annually for the life of the project.

Implementation of Plan C would result in the disposal of approximately 3 million cubic yards of new work material in the two EPA designated ocean disposal sites. This would result in a thin layer ($\leq$ 1-foot) of dredged material being placed on these sites. Although many of the organisms would be smothered, some would be able to migrate through this material. Other forms would migrate into the area or settle as larvae from the overlying water column; therefore, the use of these site should not result in

significant impacts to the aquatic resources of the area. Approximately 600,000 cubic yards of maintenance material would be placed in these sites annually. This represents an increase of about 100 percent over that which is currently placed in the sites during maintenance of the existing project however, the impacts should not be dissimilar to those of the "No Action" alternative. In addition to the use of the Gulf disposal sites, approximately 9 million cubic yards of new work material would be placed in a thin-layer ($\leq$ 1-foot) over approximately 7,000 acres of bottoms of Mississippi Sound ranging from 9 to 18 feet in depth. Thin layer disposal of new work material has been tested utilizing 50,000 cubic yards of virgin material dredged from the Gulfport Channel. The results of this test indicate that recovery from the thin layer deposition begins as early as 6 weeks after disposal operations are completed and that within 20 weeks there are no significant differences between disposal and reference areas (TAI 1988). The direct extrapolation of these results to the disposal of 8.9 million yards is not possible since during the test the dredging operation took only 2 days whereas the time required under Plan C is approximately 11 months. In addition, only 250 acres were involved in the thin-layer test. Additional information would be required to adequately address the total impacts of thin-layer disposal of 9 million cubic yards of new work material. Approximately 3.4 million cubic yards of maintenance material would be placed in Mississippi Sound annually under Plan C. This represents an increase in quantity of approximately 10 percent over the quantity disposed in Mississippi Sound under the "No Action" alternative; therefore, the impacts would be similar to those described in Section 5.2.1.

As discussed in Section 5.7 below, it is possible that a significant quantity of the material disposed at the Gulfport sites will not remain within the boundaries of the site. The site is probably dispersive in nature since historic use has not resulted in shallowing. Both the new work and maintenance material is not expected to clump or form clay balls therefore it will primarily react as unconsolidated particles of silts and clays. Impacts associated with the migration of this material from the sites are not expected to significantly affect aquatic resources since the materials to be dumped are similar in size and composition to the sediments of this region of the northern Gulf of Mexico. In addition, the organisms living in this area of the gulf are adapted to influxes of highly turbid freshwater from the Mississippi and Pearl Rivers. Monitoring of the sites will be initiated after completion of construction to determine the nature and level of impacts to this area of the gulf.

5.2.4 Plans B and D. Deepening and widening the channel in Mississippi Sound with the implementation of Plans B and D would result in the conversion of approximately 133 acres of bottoms alongside the channel in Mississippi Sound from the current depths of 8 to 16 feet to depths ranging from 38 feet to 8 feet. Approximately 147 acres in the Gulf of Mexico would be similarly deepened from the existing depth of 22 to 36 feet to 38 to 22 feet. Organisms representative of the deep open sound and offshore mud habitats would colonize the channel and it's side slopes so no change in benthic communities is expected. These areas would be disturbed on an 18 month basis as with the "No Action" alternative.

Realignment of the entrance channel would result in the conversion of approximately 187 acres of hard sand bottoms from the existing 12 to 18 feet and 119 acres of hard sand bottoms ranging from 18 to 22 feet to depths ranging to 38 feet. Organisms in this area are adapted to the physical rigors of the tidal pass inlet and are similar to organisms occupying greater depths in the inlet, therefore the impacts associated with this conversion are not considered significant. This area would be disturbed on an 18 month basis during maintenance dredging however repopulation would return the area to normal levels between maintenance cycles. The existing channel through Ship Island Pass would be allowed to fill in; therefore, with time the total change to the habitat within Ship Island Pass would be negligible.

Implementation of Plan B would result in the disposal of approximately 17 million cubic yards of new work material in the two EPA designated ocean disposal sites at Gulfport. These areas represent a total of approximately 5500 acres of offshore mud bottoms. The impacts associated with the disposal into these sites has been evaluated by the Environmental Protection Agency (1986) and that information is incorporated into this EIS by reference. In their evaluation, concern was raised relative to the quantity of material which might be placed in these sites. These impacts are addressed in Section 5.7 of this EIS. In addition, approximately 4.7 million cubic yards of maintenance material would be placed in these sites annually for the life of the project.

Implementation of Plan D would result in the disposal of approximately 4.3 million cubic yards of new work material in the two EPA designated ocean disposal sites. This would result in a thin layer ($\leq$ 1-foot) of dredged material being placed on these sites. The impacts associated with the disposal of new work material in the gulf would be similar to those described for Plan C above. Approximately 800,000 cubic yards of maintenance material would be placed in these sites annually. Although the quantity of maintenance material is increased two-fold, the impacts would be similar to those of the "No Action" alternative. In addition to the use of the Gulf disposal sites, approximately 12.9 million cubic yards of new work material would be placed in a thin-layer ($\leq$ 1-foot) over approximately 9,616 acres of bottoms ranging from 9 to 18 feet in depth. As described for Plan C, the direct extrapolation of the results of the initial Gulfport thin-layer test to the disposal of 12.9 million yards is not possible since during the test the dredging operation took only 2 days, whereas the time required under Plan C would be over 12 months. In addition, only 250 acres were involved in the thin-layer test. Additional information would be required to adequately address the total impacts of thin-layer disposal of 12.9 million cubic yards of new work material. Approximately 3.9 million cubic yards of maintenance material would be placed in Mississippi Sound annually under Plan C. This represents an increase in quantity of only 0.8 percent over the quantity disposed in Mississippi Sound under the "No Action" alternative therefore the impacts would be similar to those described in Section 5.2.1.

As discussed in Section 5.7 below, it is possible that a significant quantity of the material disposed at the Gulfport sites will not remain

within the boundaries of the site. The site is probably dispersive in nature since historic use has not resulted in shallowing. Both the new work and maintenance material is not expected to clump or form clay balls; therefore, it will primarily react as unconsolidated particles of silts and clays. Impacts associated with the migration of this material from the sites are not expected to significantly affect aquatic resources since the materials to be dumped are similar in size and composition to the sediments of this region of the northern Gulf of Mexico. In addition, the organisms living in this area of the gulf are adapted to influxes of highly turbid freshwater from the Mississippi and Pearl Rivers. Monitoring of the sites will be initiated after completion of construction to determine the nature and level of impacts to this area of the gulf.

5.2.5 Recommended Plan, Modified Plan A. Deepening the channel in Mississippi Sound by 6 feet with the implementation of Modified Plan A would result in the conversion of approximately 57 acres of bottoms alongside the channel in Mississippi Sound from the current depths of 8 to 16 feet to depths ranging from 38 feet to 8 feet. This 'widening' is due to the adjusted side slopes from the deepening. Approximately 55 acres in the Gulf of Mexico would be similarly deepened from the existing depths of 22 to 36 feet to 38 to 22 feet. Organisms representative of the deep open sound and offshore mud habitats would colonize the channel and side slopes so no change in benthic communities is expected. These areas would be disturbed on an 18 month basis as with the "No Action" alternative.

Realignment of the entrance channel would result in the conversion of approximately 160 acres of hard sand bottoms from the existing 12 to 18 feet and 100 acres of hard sand bottoms ranging from 18 to 22 feet to depths ranging to 38 feet. Organisms in this area are adapted to the physical rigors of the tidal pass inlet and are similar to organisms occupying greater depths in the inlet, therefore the impacts associated with this conversion are not considered significant. This area could be disturbed on an 18 month basis during maintenance dredging; however, repopulation would return the area to normal levels between maintenance cycles. The existing channel through Ship Island Pass would be allowed to fill in; therefore, with time the total change to the habitat within Ship Island Pass would be negligible. Projected maintenance of this channel is minimal since the existing channel would be allowed to fill, thereby capturing most of the littoral drift material.

Implementation of this plan would result in the disposal of approximately 11 million cubic yards of new work material in the two EPA designated ocean disposal sites at Gulfport. These areas represent a total of approximately 5500 acres of offshore mud bottoms. The impacts associated with the disposal into these sites has been evaluated by the Environmental Protection Agency (1986) and that information is incorporated into this EIS by reference. In their evaluation, concern was raised relative to the quantity of material which might be placed in these sites. These impacts are addressed in Section 5.7 of this EIS. In addition, approximately 600,000 cubic yards of maintenance material would be placed in these sites annually for the life of the project. This represents an increase of approximately 278,000 cubic yards over that which is placed into these sites under the "No

Action" alternative.

Approximately 1 million cubic yards of new work material dredged during the construction of the Mississippi Sound channel would be placed in a layer no greater than 12 inches in thickness over about 1,000 acres of Mississippi Sound bottoms during a demonstration program on thin layer disposal. These areas are located in the southern half of Mississippi Sound, east of the Gulfport Channel, and are characterized as deep (open sound) muddy sand habitat. The areas have historically been designated to receive maintenance material from the existing project but have not been used in the recent past.

Future maintenance material dredged from the turning basin and Mississippi Sound channel would be disposed utilizing open water disposal areas along the channel as is currently practiced. These areas have been described in Section 5.2.1 above. Impacts would be similar to those occurring under the "No Action" alternative since maintenance quantities are only projected to increase by 10% or 330,000 cubic yards.

5.3 **Wildlife Resources.** Disposal at the existing Gulf of Mexico sites and disposal at area 10 under the "No Action" alternative would continue to disrupt possible use of the area by various species of sea turtles found during spring and summer. These impacts, however, are not considered significant. No other wildlife resources would be impacted under the "No Action" alternative. Disposal in the gulf disposal areas and shallow littoral zone east of Cat Island (all plans) would have impacts similar to the "No Action" alternative. Dredging to realign the channel through Ship Island Pass is not expected to have any impacts on sea turtles since this area is hard sand which is not conducive to burrowing or hibernation by turtles. No other wildlife resources would be impacted by implementation of the other alternatives. Some possible benefits to the wildlife of Cat Island may be gained through the littoral disposal of sandy materials west of the channel, however it is not possible to quantify these benefits at this time.

5.4 **Endangered and Threatened Species.** The "No Action" alternative would not impact any endangered or threatened species.

Endangered species coordination was initiated with the U. S. Fish and Wildlife Service in August 1988 and with the National Marine Fisheries Service in September 1988. As required under Section 7 of the Endangered Species Act of 1973, as amended, the revised Draft EIS constituted the biological assessment, and was transmitted to both agencies by letter dated November 1,1988.

The Fish and Wildlife Service provided a list of 20 species which may occur in the study area including the Florida manatee, Florida panther, 5 species of whales, the bald eagle, peregrine falcon, brown pelican, Bachmann's warbler, ivory-billed and red-cockaded woodpeckers, American alligator, eastern indigo snake, and 5 species of sea turtles. The National Marine Fisheries Service indicated that the five species of whales and five species of marine turtles may be present. As indicated in Section 4.2.4 of this

document, the majority of the species listed by the Fish and Wildlife Service are restricted to upland areas. Exceptions include the Florida manatee which only occasionally wanders into this area of the Gulf and the American alligator which prefers swamps, lakes, sloughs, and sluggish streams along the mainland. Whales are primarily restricted to open gulf waters and therefore would not be impacted by implementation of the recommended plan. Sea turtles may occur within the Mississippi Sound and may nest on the gulf beaches of the barrier islands as indicated in Section 4.2.4. Of prime importance is the Kemp's (Atlantic) ridley turtle which is considered to be the most endangered of the species listed for this area. This turtle is known from the Mississippi Sound and is typically associated with shallow vegetated habitats. The recommended plan does not require dredging or disposal near any shallow vegetated habitats therefore no impacts to this species are expected to occur. Dredging to realign the channel through Ship Island Pass is not expected to have any impacts on sea turtles since this area is hard sand which is not conducive to burrowing or hibernation by turtles. The other species occur less frequently within the sound and therefore would not be impacted by the proposed action.

The U.S. Fish and Wildlife Service, in the Final Fish and Wildlife Coordination Act Report dated November 1988, indicated that no adverse effects on endangered species were expected. This report has been included in Appendix D to the General Design Memorandum. The National Marine Fisheries Service concurred with the determination that no adverse effects on species under their purview would be impacted by the proposed action (Section 8, Appendix D).

5.5 **Air Quality.** For the "No Action" alternative the existing air quality within the project area would remain unchanged. The activities associated with dredging or disposal would temporarily reduce local air quality levels due to exhaust emissions of the equipment used. These impacts are the same for the "No Action" and the recommended plan and are considered to be insignificant and limited to the immediate construction area. Construction associated with the expansion of the Port of Gulfport would result in temporary impacts to air quality within the Port facility. These impacts are considered to be insignificant due to the industrialized nature of the Port and would be limited to the immediate construction area. Any induced development into the area by the project improvement would be subject to State and Federal regulatory procedures to control emissions and protect the air quality.

5.6 **Water Quality.** Under the "No Action" alternative the existing water quality within the project area would remain the same or possibly improve in some areas while declining in other areas in the future. Open water disposal at the existing sites in Mississippi Sound and the EPA approved Gulf disposal areas would result in temporary localized increases in turbidity and nutrients and decreases in dissolved oxygen within the water column. Short term localized effects of this nature would also be present at the dredge cutterhead during maintenance operations.

Expansion of the port facility through the addition of 29 acres of parking and staging facilities could impact water quality of Mississippi Sound

through spills and stormwater run-off. As part of the mitigation for the impacts associated with this expansion, the port authority has agreed to implement a stormwater management plan. This plan in addition to the use of best management practices will minimize the possible impact to water quality from the use of the facility.

The disposal of materials in the littoral zone east of Cat Island and/or the beach nourishment site at Fort Massachusetts (all alternatives) would have no long term impact on water quality. The materials to be disposed in this area are primarily scoured coarse grain sands which would settle quickly through the water column to the bottom where they would enter into the natural littoral process. This action has been evaluated subject to the Section 404(b) Guidelines and this evaluation is contained in Appendix D.

Removal of the breakwater and relocation of the pipeline would cause temporary increases in turbidity and suspended solids concentrations in the vicinity of the construction activities. These increases would be short term and within the natural range of variability of these parameters in this area.

Disposal of one million cubic yards of new work mater al in Mississippi Sound with implementation of Modified Plan A would result in increases in suspended solids and turbidity. The significance of other impacts to water quality unknown at this time, however since this demonstration program is restricted to 3 separate 10 day disposal events it is felt that any impacts would be short term in nature. Investigation of possible impacts to water quality is part of the three year demonstration program which is contained in Appendix D. This action has been evaluated subject to the Section 404(b) Guidelines and this evaluation is contained in Appendix D. Disposal of 12 to 17 million cubic yards of new work material (Plans C and D, respectively) would effect water quality within Mississippi Sound for up to one year during construction. The significance of these impacts is unknown, however the system naturally experiences highly turbid conditions.

Disposal of maintenance material in Mississippi Sound under Plans C and D and Modified Plan A would have impacts similar to the "No Action" alternative since the increase in quantity is only on the order of 10% or 330,000 cubic yards. At a dredging rate of 30,000 cubic yards per day this would increase the length of disposal operations by 11 days. Disposal of maintenance material under Modified Plan A has been evaluated subject to the Section 404(b) Guidelines and this evaluation is contained in Appendix D.

Disposal of dredged material in the Gulfport ODMDS under all plans would probably not result in significant impacts to water quality. Short term increases in turbidity and nutrient levels would be expected to occur in the vicinity of the dump zone. Decreases in near bottom dissolved oxygen levels would probably occur in this zone as well. Due to the depths within these sites and nature of the materials proposed for disposal, mounding is not expected to pose a problem. Impacts would be of a longer duration during construction of alternatives C or D or Modified Plan A; however, overall impacts would not be significant. The impacts associated with Modified Plan A on ocean resources have been evaluated in accordance with Section 103 of

the Marine Protection, Research, and Sanctuaries Act. This evaluation is contained in Appendix D.

Improvements to the channel could possibly result in the wedge of salt water moving landward in the channel and possibly impacting groundwater resources. It is not felt that a significant movement of the salt wedge would occur, however, since the channel depth would only be increased by 6 feet. Numerical model applications comparing a 'preproject' condition (channel depth of 10 - 12 feet and Camille Cut closed) to the existing condition (channel depth of 30 - 32 feet and Camille Cut opened, concluded that no significant changes in salinity patterns within Mississippi Sound have occurred due to the construction of the project. It appeared that greater impacts occurred due to the opening of Camille Cut in 1969.

5.7 **Circulation.** During the Mississippi Sound and Adjacent Areas Study the Gulfport Harbor complex was analyzed utilizing a two-dimensional hydrodynamic model. The major focus of these studies was to determine the impacts associated with different disposal practices and not improving the channel per se, however, the results do provide insight into the impacts associated with channel improvement. As part of these studies, preproject conditions, i.e. channel depth 10-12 feet, was compared to existing conditions, i.e. channel depth 30 - 32 feet. These preproject conditions also included the closure of Camille Cut, a break in Ship Island caused by Hurricane Camille in 1969. Results of this comparison indicated that no significant changes in circulation or salinity patterns had occurred due to construction of the existing project. Velocities were shown to increase slightly (0.2 fps) in a 3 mile area north of the GIWW and within Ship Island Pass. The impacts associated with the opening of Camille Cut appears to have resulted in greater impact to circulation and salinity patterns of this region of Mississippi Sound than construction of the existing Federal project at Gulfport. Other model studies investigating the impacts associated with the improvements of the Federal projects at Pascagoula, Mississippi, and Mobile, Alabama, have indicated that the deepening and or widening of these channels would result in localized changes in current velocities and salinity gradients but that these changes do not result in significant changes in overall circulation or salinity patterns.

Comparison of model results from the existing channel and the scenario involving the thin-layer disposal of construction material in Mississippi Sound did not reveal any impacts to circulation that could be the result of the disposal. The materials which are to be dredged at Gulfport are soft with a very high water content. The disposal of these materials under normal circumstances results in thin-layer deposition of dredged material.

As indicated in Section 5.2.3, the Environmental Protection Agency indicated concern relative to the quantity of material which could be placed at the ocean disposal sites. Historic use of these sites has not resulted in shallowing of depths which indicates that the site is dispersive in nature. The nature of the material to be disposed in these sites during the construction and maintenance of the Gulfport project does not indicate that clumping or mounding after disposal will be a problem. The material has a very high water content, possible as high as 70%, therefore the material

will tend to spread when it hits the bottom after disposal and significant quantities could become entrained in the water column and be transported from the site.

5.8 **Sediment Quality.** The impact of disposal of sediments from the Gulfport Channel in open water on marine organisms has been evaluated by the Environmental Protection Agency (1988) following standard toxicity and bioaccumulation procedures. Results of these evaluations indicate that the toxicity of the materials proposed for disposal are minimal and although the organisms tested showed some ability to bioaccumulate certain parameters, the magnitude of this potential is not considered significant. Residues of selected pesticides and PCB's were not detected in either sediments or animal tissues before or after exposure, but several heavy metals were detected. Although statistically significant differences were determined for zinc and selenium in shrimp (Penaeus duorarum), the magnitude of the differences may not indicate a bioaccumulation potential. Aliphatic and aromatic petroleum hydrocarbon residues were detected in shrimp and lugworms exposed to sediments and in sediments from within the harbor and the upper portion of the Mississippi Sound Channel. Concentrations of residues of both fractions were higher in lugworms exposed to channel sediment than to reference sediment. No statistically significant differences could be found for shrimp. Although "significant" bioaccumulation did occur in some instances, the magnitude of this bioaccumulation must be considered. When the magnitude ($\leq$ 3.3X) is considered, it is apparent that the bioaccumulation which occurred during these studies does not warrant concern. This is based on a comparison of the uptake of single chemicals in laboratory tests under conditions of constant exposure. In such tests, commonly conducted with similar organisms and pesticides/toxic substances, bioaccumulation of chemicals in tissue $\geq$100X the chemical concentration in water is usually of little concern, particularly when the expected environmental concentration of the chemical is less or much less than the concentration tested in the laboratory. Potential exposure, a factor that these tests were not intended to address, is an essential factor in conducting any risk assessment.

5.9 **Groundwater Resources.** Groundwater resources of the Gulfport area are good under the existing project and no significant changes are projected to occur in the future under the "No Action" alternative. No changes in groundwater resources are expected with the implementation of any of the plans considered in detail.

5.10 **Land Resource and Use.** The proposed 29 acre expansion by the Port of Gulfport is projected to occur with or without implementation of any of the plans considered in detail. Erosion around Fort Massachusetts is expected to continue to occur under the "No Action" alternative and beach nourishment would be accomplished on a four to six year cycle depending on the ability of the National Park Service to pay any incremental costs associated with this operation. Implementation of any of the plans considered in detail may result in a slowing of the erosion of the western end of West Ship Island. The realignment of the channel approximately 1900 feet to the west of the existing channel would negate the need to maintain the channel and deposition basin adjacent to the western end of the island. Material in the

littoral drift would be trapped in the old channel and could possibly provide stability to the end of the island. Data are not currently available to determine the accuracy of this projection.

As discussed in Section 4.2.10, Cat Island is a part of the Coastal Barrier Resources System (CBRS) which prohibits expenditure of Federal funds except as provided in Section 6 of the Act. Even though the proposed littoral zone disposal area is outside the boundaries of the Cat Island CBRS Unit, some of the materials disposed in this area will more than likely be transported onto the shores of the island by the littoral drift currents. The Department of Interior has indicated that currently there is no new sand entering the Cat Island system, so the island must maintain itself by using its own sand. Sand from the north-south trending part of the island is eroding, and incidental waves are using that material to extend the South Spit. The proposed disposal therefore could indirectly provide 'new' sand to the system and alleviate the erosion on the north-south part of the island (DOI 1987).

5.11 **Mineral Exploration and Production.** No impacts to mineral exploration and production would occur from implementation of any of the alternatives considered in detail.

5.12 **Demography.** No impacts to demography would occur from implementation of any of the alternatives considered in detail.

5.13 **Economy.** Under the "No Action" alternative the economic output of the Port of Gulfport would continue at present levels and possible decline in the future due to the inadequacy of the channel for ships of the fleet. Implementation of any of the plans considered in detail would allow the vessels which currently call at the port to do so in a fully loaded state. This would not only save the shipper resources but would also allow full utilization of the facilities at Gulfport. For additional information please refer to the General Design Memorandum Main Report and the Economic Appendix, Appendix A.

5.14 **Community Cohesion.** No impact to community cohesion would occur with implementation of any of the alternatives considered in detail.

5.15 **Recreational Opportunities.** None of the plans considered in detail would have a direct effect on recreational opportunity of the Gulfport area. Indirect effects may result from increased economic output from the port which translates into increased resources for individual recreation activities.

5.16 **Noise.** For the "No Action" alternative the existing noise levels in the project area would remain the same. Construction and maintenance of any of the alternative plans considered in detail would cause elevated background noise levels due to the equipment used. Duration of increased noise level would be increased during construction; duration during maintenance operations would remain the same. During each instance, however the levels would be similar to those during the "No Action" alternative. These elevated noise levels are of a temporary nature and since much of the

area is removed from inhabited areas these impacts would not be significant. There would be no long-term noise impact on fish or wildlife.

5.17 **Aesthetics.** Under the "No Action" alternative the aesthetics of the area would remain in a similar condition to that currently existing. The presence of the dredge and attendant equipment would continue to cause a temporary degradation in aesthetics during each 18 month maintenance cycle. Implementation of any of the alternative plans would have similar impacts to the "No Action" alternative. The expansion of the port facility would result in a change in the aesthetics of that area however, with proper onsite management this change would not be detrimental to the area.

5.18 **Transportation.** Under the "No Action" alternative transportation into the Port of Gulfport would continue to be restricted by the 30-foot channel. Implementation of any of the alternatives would greatly enhance waterborne transportation into the port. Other transportation facilities would not be adversely affected by any of the plans.

5.19 **Public Facilities and Services.** Public facilities and services in Gulfport and this area of the Mississippi Coast would not be adversely affected by any of the plans considered in detail.

5.20 **Cultural Resources.** The "No Action" alternative would have no affect on the cultural resources of the area. The periodic nourishment of the Fort Massachusetts area would continue to preserve this historic structure. This would continue with any of the plans considered in detail. No impacts to underwater archeological resources would occur with any of the plans considered in detail (See Section 5, Appendix D).

6.0 **SUMMARY OF MITIGATION MEASURES.** An interagency team was assembled by the Mississippi Bureau of Marine Resources at the request of the Port of Gulfport. This team consisted of representatives of the U.S. Army Corps of Engineers, Environmental Protection Agency, Fish and Wildlife Service, National Marine Fisheries Service, Mississippi Bureau of Pollution Control, Mississippi Bureau of Marine Resources, and the Port of Gulfport. As a result of a this coordination, a number of generic mitigation projects were suggested and furnished to the port staff. The Port Authority will be responsible for the implementation of the mitigation plan as a condition to the Section 404 Permit issued by the Corps of Engineers. There is no additional mitigation required for the implementation of the recommended plan.

The suggested generic mitigation projects and their relative mitigation credits are listed below. Twenty-nine mitigation credits have been recommended by a number of the agencies listed above to adequately mitigate for the impacts resulting from the filling of 29 acres and the possible water quality impacts resulting from the construction and use of the expansion area. The final mitigation plan is under consideration by the interagency team and the details of the approved plan will be incorporated into the Department of Army permit.

1. Establish fish haven with rip-rap material presently stored at Port facility (Credit 3:1, e.g., 3 acres of fish haven would be required for one acre of botttom filled).

2. Restoration of disturbed wetlands areas in the Back Bay Biloxi/Bay St. Louis areas (i.e., return filled wetlands/uplands to wetlands - Credit 1.5:1 to 1:1 determined by on-site inspection).

3. Creation of wetland areas in the Back Bay Biloxi/Bay St. Louis areas (Credit 1:1)

4. Enhancement of disturbed wetland areas in the Back Bay/Bay St. Louis areas (i.e., opening diked marsh areas to improve tidal flushing - Credit 3:1).

5. Establish new oyster reefs with cultch material and live oysters (Credit 2:1).

6. Enhancement of existing oyster reefs with cultch material (Credit 3:1).

7. Creation of waterbottoms (from upland areas - Credit 1:1).

8. Implement a comprehensive stormwater management plan for the Port which will eliminate stormwater discharge into Mississippi Sound (Credit 1:1 up to 15 acres maximum credit).

7.0 LIST OF PREPARERS.

Name	Expertise	Experience	Role in RDEIS Preparation
J. Baker	Engineering/ Civil	7 years, Operations, Mobile District	Formulation of Alternatives, Cost Estimates
J. Brandt	Environmental Laws and Regulations	3 years, Environmental Compliance, Fort Benning, GA; 8 years, Regulatory Program, Mobile District	Project Manager, Dept Army Permit Application MS88-00954-L
C. Flakes	Environmental Laws and Regulations	7 years, Environmental Compliance, Mobile District	Environmental Compliance Manager
D. Gibbens	Archeology	10 years, Cultural Resource Management, Mobile District	Effects on Cultural Resources
J. Grandison	Community Planner	7 years, City Planning; 4 years, Community Development; 7 years Study Management, Mobile District	Study Manager, Formulation of Alternatives
S. Ivester Rees	Oceanography	6 years, Assistant Professor, Univ. Alabama; 7 years EIS Studies, Mobile District	EIS Preparation

8.0 PUBLIC INVOLVEMENT.

8.1 Public Involvement Program. Public involvement was initiated during the development of the Feasibility Report and is continuing with the coordination of this document.

8.2 Required Coordination. Coordination for this study began in 1974. Principal Federal agencies with which coordination has been conducted include the Fish and Wildlife Service, National Marine Fisheries Service, Gulf of Mexico Fishery Management Council, Gulf Islands National Seashore (National Park Service) and Environmental Protection Agency. At the State level coordination has been through the State of Mississippi Department of Wildlife Conservation, Bureau of Marine Resources and it's predecessor the Mississippi Marine Resources Center, Mississippi Department of Natural Resources, Bureau of Pollution Control, and Mississippi State Historic Preservation Officer.

8.3 Statement of Recipients. This final Environmental Impact Statement is being sent to the following:

Governor Ray Mabius

Advisory Council on Historic Preservation
Federal Highway Administration
Food and Drug Administration
Heritage Conservation and Recreation Service
Department of Interior
  Fish and Wildlife Service
  National Park Service
Department of Commence
  National Marine Fisheries Service
  Gulf of Mexico Fishery Management Council
Department of Transportation
  Coast Guard
Department of Health and Human Services
Department of Energy
Department of Housing and Urban Development
Soil Conservation Service
Environmental Protection Agency
Federal Maritime Commission
Federal Highway Administration
Federal Aviation Administration
Federal Railroad Administration
Federal Emergency Management Administration
U S Forest Service

Alabama-Mississippi Sea Grant Consortium
Mississippi Department of Natural Resources
Mississippi Department of Wildlife Conservation
Mississippi Department of Archives and History
State Conservation Service
Gulf Coast Research Laboratory

8.4 **Public Views, Revised Draft EIS Dated June 20, 1977.** A revised Draft Environmental Impact Statement was circulated for review and comment to appropriate Federal, State, and local governmental agencies on June 20, 1977. The following is a summary of the comments received on that document.

8.4.1 The Environmental Protection Agency indicated that certain features of the project, such as the proposed island construction/stabilization and the method of disposal were environmentally questionable and that further research in these two areas was necessary. They also indicated that the cost of the EQ plan, i.e., depositing all Sound materials in the Gulf, should be re-evaluated on the basis of a regional operation and more realistic figures on the cost of equipment.

8.4.2 The Department of Health, Education, and Welfare recommended that a monitoring plan be established to safeguard the shellfish and finfish of the harbor area.

8.4.3 The Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service commented that they were pleased to note that their interests in regard to circulation and biological effects of spoil islands and the 'thin layer' disposal plan, and reconsideration of alternatives including offshore disposal were to be addressed in the Phase 1 Advanced Engineering and Design recommended by the Board of Engineers. They also indicated they would be agreeable to a decision to fund construction employing only offshore disposal.

8.4.4 The Department of the Interior indicated that the proposed project would, in their opinion, adversely impact Mississippi Sound's valuable fish and wildlife resources but that the degree of impact could not presently be determined because of a lack of knowledge concerning the material's interaction with the biological and hydrological conditions within the Sound. In general, they indicated support for the recommendation for Phase 1 studies and that they would oppose authorization for construction prior to completion of adequate biological and hydrological studies of Mississippi Sound.

8.4.5 The Office of the Governor, State of Mississippi indicated general agreement with the proposed report on the Gulfport Harbor project. The principal concern raised by the Governor's Office was in regard to the recommendation that a Phase 1 Study be authorized. "It is the opinion of the Mississippi Marine Resources Council, other State agencies, and concerned environmental groups that the creation of artificial islands within the Mississippi Sound is the only feasible method of dredge spoil disposal. The Marine Resources Council also believes that ecological baseline studies, or even a physical model of the Mississippi Sound, could proceed concurrently with the creation of these islands. It is my feeling that the project has received sufficient study, and I urge you to eliminate this requirement that will result in further delays for a much needed project."

8.4.6 The Mississippi Department of Archives and History indicated a need for a magnetometer survey of all disposal areas.

8.4.7 The Onondaga Audubon Society, Inc. of Syracuse, New York indicated a concern over the reintroduction of toxic chemicals into coastal food chains of various bird species. They also indicated their opinion that disposal of dredged material should be undertaken only on very well-diked upland areas, or in deep Gulf waters at a depth sufficient to keep contaminated sediments beyond normal coastal wave and biological processes.

An Addendum to the revised Draft EIS containing responses to these comments was filed with the Environmental Protection Agency on December 18, 1977.

8.5 **Public Views, Revised Draft EIS Dated October 1988.** The major comments received on the RDEIS are concerned with the following topics:

Adherence to safety guidelines to minimize hazards during construction

Protection of Fort Massachusetts

Thin layer disposal

Coastal Barrier Resources Act

All Comments have been appropriately responded to and necessary changes have been made to the text of the EIS or General Design Memorandum as specifically indicated in the Public Views and Responses Section (Paragraph 8.6).

8.6 **Public Views and Responses.** The RDEIS was coordinated with the agencies and individuals listed in Section 8.3 above. A total of five letters of comment were received concerning the RDEIS. Copies of these letters follow. Comments were received from the following:

	FEIS Page Number of Letter
U. S. Environmental Protection Agency, Region IV	EIS-53
Department of Health & Human Services	EIS-55
U. S. Department of Transportation, Federal Highway Administration	EIS-57
U. S. Department of Interior	EIS-59
State of Mississippi, State Clearinghouse for Federal Programs	EIS-65

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IV
345 COURTLAND STREET
ATLANTA, GEORGIA 30365

JAN 1988

4PM-EA/GJM

Colonel Larry S. Bonine
District Engineer
U.S. Army Corps of Engineers, Mobile
P.O. Box 2288
Mobile, Alabama 36628-0001

SUBJECT: Draft Environmental Impact Statement-Navigation Improvements
To Gulfport Harbor (Harrison County), Mississippi
EPA Log No.: DR-COE-E32070-MS

Dear Colonel Bonine:

Under the authority of Section 309 of the Clean Air Act and Section 102(2)(C) of the National Environmental Policy Act, EPA, Region IV has reviewed the subject document. The recommended plan (Alternative A) contains the design elements/mitigation features for the channel upgrades and spoil disposal options which were agreed upon by the involved parties during the recurrent interagency coordination meetings on this facility. As a result of this resolution, a rating of LO has been assigned. That is, we have no significant environmental objections to the project as it is currently proposed. However, in the event that any substantive modifications are made to the present design, we reserve the prerogative of providing additional comment/evaluation on the environmental ramifications of these modifications.

If we can be of any further assistance, please feel free to contact Dr. Gerald J. Miller of my staff at FTS 257-7109 or 404/347-7109.

Sincerely yours,

Heinz J. Mueller

Heinz J. Mueller, Acting Chief
NEPA Review Staff
Environmental Assessment Branch

Response to U. S. Environmental Protection Agency, Region IV

1. Comment noted. We appreciate EPA's contribution to the Gulfport studies. The plan (Modified Plan A) recommended in this FEIS is different from that reviewed during the coordination of the revised DEIS. The EPA, both Region IV and Headquarters, have been involved in the evolution of Modified Plan A and the development of the Demonstration Program to investigate the effects of thin layer disposal on marine resources. EPA will continue to be a major player in these efforts and in the development of the final plan for the future maintenance of the improved project as required in the Water Resources Development Act of 1988 (P. L. 100-676).

DEPARTMENT OF HEALTH & HUMAN SERVICES

Public Health Service

Centers for Disease Control
Atlanta GA 30333

December 23, 1988

Hugh A. McClellan
Chief, Environment and
Resources Branch
District Engineer
Mobile District, U.S. Army
Corps of Engineers
P.O. Box 2288
Mobile, Alabama 36638-0001

Dear Mr. McClellan:

We have reviewed the Draft General Design Memorandum and Environmental Impact Statement (DEIS) for "Gulfport Harbor, Mississippi". We are responding on behalf of the U.S. Public Health Service. We have reviewed the document for possible health effects and found no extraordinary potential impacts on public health and safety. The project appears to offer a considerable navigation improvement for the Gulfport Harbor. We did note a statement in the documentation certifying that dredged sediments proposed for ocean disposal are free from significant toxic compounds. Since the project will involve construction/dredging operations, we recommend close adherence to Occupational Safety and Health Administration standards as well as other relevant safety guidelines to minimize hazards during the project.

Thank you for sending this document for our review. Please insure that we are included on your mailing list for the Final Report and environmental assessment as well as further documents which are developed under the National Environmental Policy Act (NEPA).

Sincerely yours,

David E. Clapp, Ph.D., P.E., CIH
Environmental Health Scientist
Special Programs Group
Center for Environmental Health
and Injury Control

Response to Department of Health and Human Services.

1. Comment noted. We appreciate the U.S. Public Health Service review of the documents. All Contractors of the U.S. Army Corps of Engineers are required to abide by the U.S. Army Corps of Engineers Safety Manual which incorporates all Occupational Safety and Health Administration requirements for this type work as well as Coast Guard Regulations.

U.S. Department
of Transportation

**Federal Highway
Administration**

Alabama Division Office

441 High Street
Montgomery, Alabama 36104 4084

November 10, 1988

IN REPLY REFER TO

HEC-AL

Mr. Hugh A. McClellan
Chief, Environment and
Resources Branch
Department of the Army
Mobile District, Corps of Engineers
P. O. Box 2288
Mobile, Alabama 36628-0001

Dear Mr. McClellan:

Subject: Draft General Design Memorandum and
Revised Draft Environmental
Impact Statement (DEIS) for
Navigation Improvements at Gulfport
Harbor, Mississippi

We have reviewed the subject DEIS and have no comments to offer; however, we appreciate the opportunity to respond.

Sincerely yours,

for Joe D. Wilkerson
Division Administrator

Response to U.S. Department of Transportation, Federal Highway Administration

1. No comment required.

United States Department of the Interior

OFFICE OF ENVIRONMENTAL PROJECT REVIEW
ROBERT B. RUSSELL FEDERAL BUILDING, SUITE 1320
75 SPRING STREET, S.W.
ATLANTA, GEORGIA 30303

DEC 29 1988

ER 88/980

Colonel Larry Bonine
District Engineer
U.S. Army Corps of Engineers
P.O. Box 2288
Mobile, Alabama 36628-0001

Dear Colonel Bonine:

We have reviewed the draft environmental statement and draft general design memorandum for navigation improvements at Gulfport Harbor, Mississippi, and have the following comments.

General Comments

The draft environmental impact statement and general design memorandum adequately address resources of concern to the Department of the Interior. The recommended plan provides the greatest potential for long term preservation of natural and historic features and values encompassed by Gulf Islands National Seashore. 1

Past efforts to provide for the protection of Fort Massachusetts have been close cooperative efforts between the Corps of Engineers (Corps) and the National Park Service. While the recommended plan is believed to have the greatest potential for minimizing future impacts to the geomorphic character of Ship Island, the ability to protect Fort Massachusetts through periodic beach renourishment is being compromised. Protection measures will no longer be readily incorporated within periodic maintenance operations, from both a logistic an fiscal perspective. Fort Massachusetts is an historic resource of national significance, the preservation of which is a shared responsibility among all Federal agencies. Additional consideration should be given to firmly incorporating the periodic beach renourishment of West Ship Island within the plans and associated cost analysis for initial construction and future maintenance of the Gulfport Ship Channel. 2

The disruption of coastal processes which has resulted from the existing channel alignment and maintenance practices has significantly impacted the natural dynamics and stability of the Ship Island landforms. The proposed 3

westward realignment of the channel should provide for the resumption of natural island migration and may contribute to a lessening of erosional stress in the vicinity of Fort Massachusetts, a National Historic Register site,

The incremental increase in cost estimate for renourishment of beaches on West Ship Island is based upon the use of a hydraulic dredge, mobilized exclusively for this aspect. Given the proposed use of a hopper dredge for the construction of the Gulf and Ship Island Pass segments of the project, the reports should clarify whether the use of a hopper dredge with pumpout capability was considered in evaluating options and cost analysis for beach nourishment, 4

Some efforts must be expended to guarantee the quality of the fill destined for the western end of Ship Island. This fill should match the native material and be low in organic and/or hydrogen sulfide content, 5

A major concern of the Department of the Interior involves the possible use of a new thin layer disposal method in the Mississippi Sound. As currently proposed under the recommended Plan A, all of the material dredged from the Mississippi Sound portion of the channel will be disposed in the gulf. We have continued to support gulf disposal in lieu of thin layer disposal over the more shallow waters of the Sound. A major reason for this position is that adequate impact studies associated with thin layer disposal have not been conducted for long-term disposal such as that proposed for Gulfport Harbor. The Corps, Mobile District, conducted a short-term (2-day dredging) impact analysis of thin layer in the Sound in December of 1986. However, this small project was in no way comparable to the magnitude of that being proposed which will require almost 1 year of dredging,

Even though thin layer has not been proposed as a feature of the recommended Plan A, it is being considered as a possible feature of this project as proposed under alternative Plans C and D. Furthermore, implementation of the thin layer disposal method has been authorized (with specific restrictions) in the Water Resource Development Act of 1988 (Act). In general, the Act authorizes the Secretary of Army to use thin layer disposal as a demonstration program for the purpose of evaluating the cost and benefits of such disposal method and also for environmental impact analysis. If thin layer disposal is pursued, the Act directs that it first be adequately studied under guidelines established by a study team composed of Federal and State reviewing agencies. Such studies should include but not be limited to features such as location and number of test sites, amounts of dredged material for testing, duration of test, and organisms to be tested, 6

On several previous occasions, the Fish and Wildlife Service has expressed concerns over the thin layer disposal method and the inadequacy of past studies. Letters of October 20, 1987, and April 21, 1988, to the Mobile Corps District Engineer clearly express our concerns over this issue. The Fish and Wildlife Service also submitted a final Fish and Wildlife Coordination Act Report (November 1988) which supports the recommended plan that requires gulf disposal of new work and maintenance material.

If the thin layer disposal method is to be further considered by the Corps, then future environmental documents should adequately address studies, impact analysis, and final opinions of the study team. In addition, consideration should be given to the possible use of equipment used for this alternative for beach nourishment at West Ship Island. If the thin layer alternative is selected as the preferred alternative without consideration of these studies and recommendations, the Department may consider referral of this matter to the Council on Environmental Quality (CEQ) for their review.

Specific Comments

Page EIS-33, Section 5,2,2, Paragraph 3 - This section should address impacts, if any, this project could have on barrier islands (Cat Island) and reasons it will or will not involve the Coastal Barriers Resources Act. 7

Page EIS-39, Section 5,6, Paragraph 5 - The statement that the disposal of new work and maintenance in Mississippi Sound under Plans C and D would have similar impacts to the "no action" alternative should be deleted. Plans C and D both incorporate the use of thin layer disposal which as stated on Pages 35 and 36 will require more study before the impact of this disposal method can be determined. This paragraph should state that the impacts of Alternatives C and D are currently unknown and should not be implemented until adequate impact studies are conducted that are acceptable to Federal and State reviewing agencies. 8

Page 32, Paragraph 67, General Design Memorandum - The estimate of incremental increase in cost required to renourish the shoreline of West Ship Island adjacent to Fort Massachusetts as opposed to littoral disposal is believed to be inaccurate. This estimate is based upon the 1983 dredging contract and incorrectly states the amount of material pumped to the beach as 2,590,000 cubic yards. As documented by a post dredging report from the contractor the actual amount deposited during this operation was approximately 210,000 cubic yards. This amount is also believed to reflect the upper limit of current existing need for renourishment at Fort Massachusetts. A revised estimate of incremental increase in cost for beach renourishment of West Ship Island is needed, and should be included in the final reports. 9

Summary Comments

Bureaus within the Department have coordinated with the Corps throughout the planning process and a position regarding this action has been repeatedly stated. As expressed in the final Fish and Wildlife Coordination Act Report, there are no objections to the current recommended plan which incorporates Gulf disposal of all new work and maintenance material. We also have no objection to the permitted port expansion of 29 acres provided adequate mitigation is provided. Serious consideration needs to be made for beach nourishment on West Ship Island for protection of Fort Massachusetts. 10

We do not believe that adequate studies have been conducted to determine the environmental impacts of thin layer disposal. If a study team, as prescribed by the Act, is designated for purposes of studying thin layer disposal, the Department would like to be an active participant. If future environmental documents recommend thin layer for this project without adequate environmental safeguards such as the guidance and recommendations of a Federal and State agency study team, then the Service would likely refer the issue to CEQ. 11

Thnak you for the opportunity to review and comment on the Gulfport Harbor documents.

Sincerely yours,

James H. Lee
Regional Environmental Officer

Response to U.S. Department of the Interior

1. Comment noted. No response necessary.

2. Periodic beach nourishment of Fort Massachusetts is still a viable option with the proposed improvements to the Gulfport Harbor. Every effort will be made to utilize dredged materials to protect the Fort, a National monument, from damages caused by shoreline erosion. We will continue to coordinate with the National Park Service, as in the past, relative to future nourishment actions on Ship Island.

3. Comment noted. Although the maintenance of the existing Ship Island Pass channel impedes the westward drift of the island, the most significant impact to the natural dynamics and stability of the island resulted from Hurricane Camille in 1969. We agree that relocation of the pass channel should provide for resumption of island migration.

4. This section of the General Design Memorandum has been modified. During the contracting process, the Corps of Engineers typically specifies disposal areas not dredging equipment required for use. Contractors then bid on the job utilizing the equipment they wish to use. Given the location of the littoral zone disposal area and the beach nourishment area a hopper with pumpout capability or a hydraulic pipeline dredge could perform the work.

5. Comment noted. The material removed from the Ship Island Pass channel is predominately littoral drift material that has been trapped within the channel and therefore is characteristic of material currently on Ship Island. If the nature of the material is in question, the National Park Service should determine whether it is acceptable prior to requesting the beach nourishment activities.

6. Comment noted. The Corps of Engineers is aware of the U.S. Fish and Wildlife Service concerns relative to thin layer disposal. The Daphne Field Office has been involved in the evolution of Modified Plan A and the development of the Demonstration Program to investigate the effects of thin layer disposal on marine resources. They will continue to be a major player in these efforts and in the development of the final plan for the future maintenance of the improved project as required in the Water Resources Development Act of 1988 (P. L. 100-676).

We acknowledge your right to refer this matter to the Council on Environmental Quality for review.

7. Comment noted. A paragraph has been added to Section 4.2.10, entitled 'Land Resource and Use', of the FEIS which describes the Coastal Barrier Resources Act and it's relationship to the proposed activities. A paragraph has also been added to Section 5.10, pages EIS-45 and EIS-46 which describes the indirect effects the use of the proposed littoral zone disposal may have on alleviating shoreline erosion on Cat Island. The actual activities, however, are outside the boundaries of the Cat Island Unit.

8. Comment noted. Changes have been made throughout Section 5 of the FEIS to include the impacts associated with Modified Plan A.

9. We agree. The appropriate changes have been made in the General Design Memorandum. Additional information has also been provided in the FEIS relative to this issue.

10. Comment noted. We have been in contact with Mr. Larry Goldman, Daphne Field Office relative to the final Fish and Wildlife Coordination Act Report and the need for a modification to include an assessment of the impacts associated with Modified Plan A. A mitigation plan is currently being developed for the port expansion activities by an interagency team including the Fish and Wildlife Service. We will continue to maintain close coordination with the National Park Service concerning the beach nourishment issue.

11. Comment noted. The Fish and Wildlife Service is an active member of the Gulfport Harbor Demonstration Study Team.

STATE OF MISSISSIPPI
OFFICE OF THE GOVERNOR

JOHN HORHN
Executive Director
Federal-State Programs

MARY BUCKLEY
Director
Department of Planning and Policy

MEMORANDUM

TO: Department of the Army
Mobile District, Corps of Engineers
P. O. Box 2288
Mobile, AL 36628

DATE: December 2, 1988

FROM: STATE CLEARINGHOUSE FOR FEDERAL PROGRAMS

SUBJECT: REVIEW COMMENTS

Activity: Draft General Design Memorandum and Revised Draft Environmental Impact Statement (DEIS) for navigation improvements at Gulfport Harbor, Mississippi.

State Application Identifier Number: MS881108-003R

Location: Harrison/Southern

Contact: Dr. Susan Ivester Rees

The State Clearinghouse, in cooperation with state agencies interested or possibly affected, has completed the review process for the activity described above.

INTERGOVERNMENTAL REVIEW PROCESS COMPLIANCE:

( ) We are enclosing the comments received from the state agencies for your consideration and appropriate action. The remaining agencies involved in the review did not have comments or recommendations to offer at this time. A copy of this letter is to be attached to the application as evidence of compliance with Executive Order 12372 review requirements.

( ) Conditional clearance pending Archives and History's approval.

(X) None of the state agencies involved in the review had comments or recommendations to offer at this time. This concludes the State Clearinghouse review, and we encourage appropriate action as soon as possible. A copy of this letter is to be attached to the application as evidence of compliance with Executive Order 12372 review requirements.

( ) The review of this activity is being extended for a period not to exceed 60 days from the receipt of notification to allow adequate time for review.

COASTAL PROGRAM COMPLIANCE (Coastal area activities only):

( ) The activity has been reviewed and complies with the Mississippi Coastal Program. A consistency certification is to be issued by the Bureau of Marine Resources in accordance with the Coastal Zone Management Act.

( ) The activity has been reviewed and does not comply with the Mississippi Coastal Program.

cc: Funding Agency (As requested by applicant)

Ike Sanford Building — 637 North President Street — Jackson, Mississippi 39201 — (601) 354-7016

Response to State of Mississippi, State Clearinghouse for Federal Programs

1. No response necessary.

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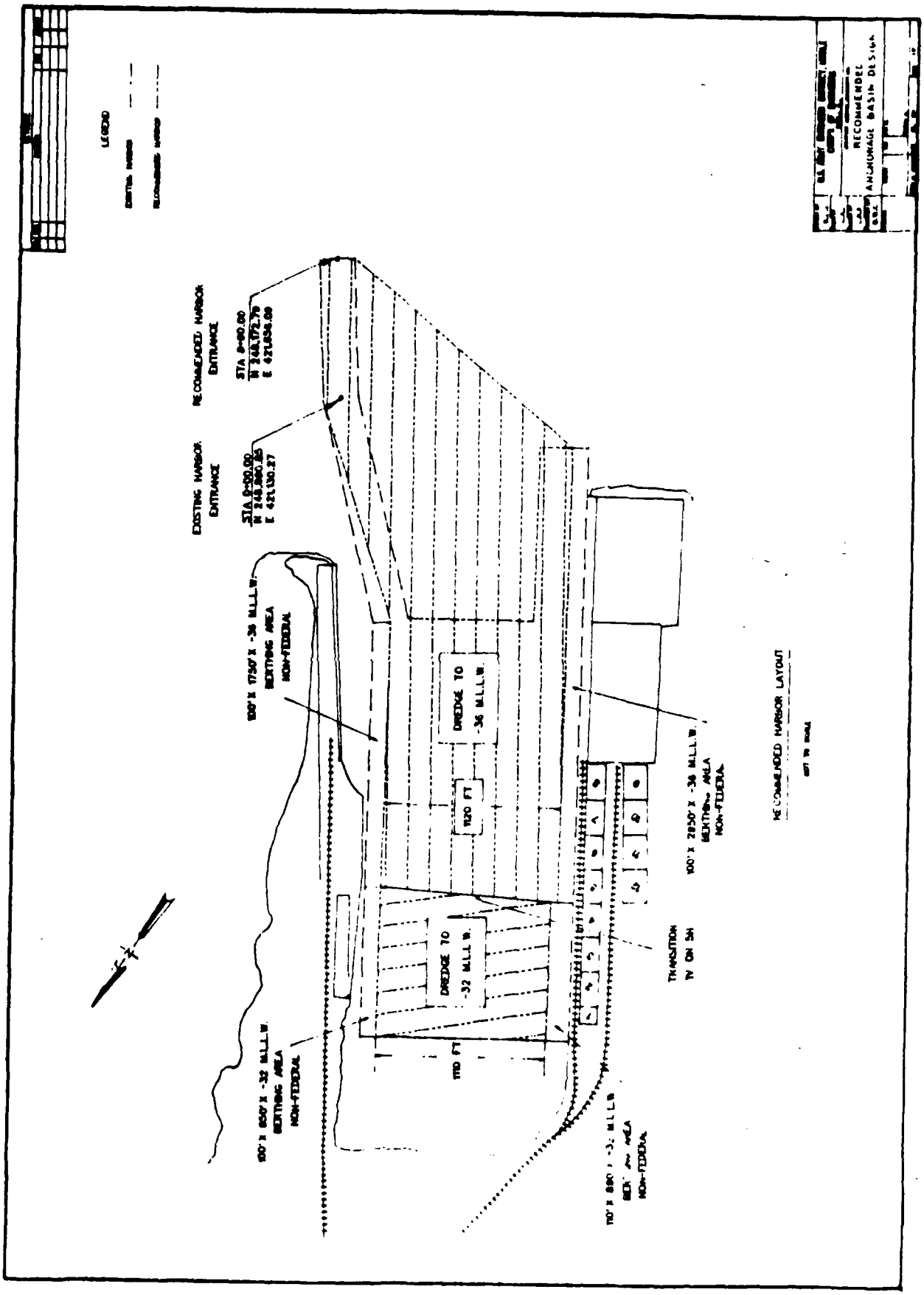
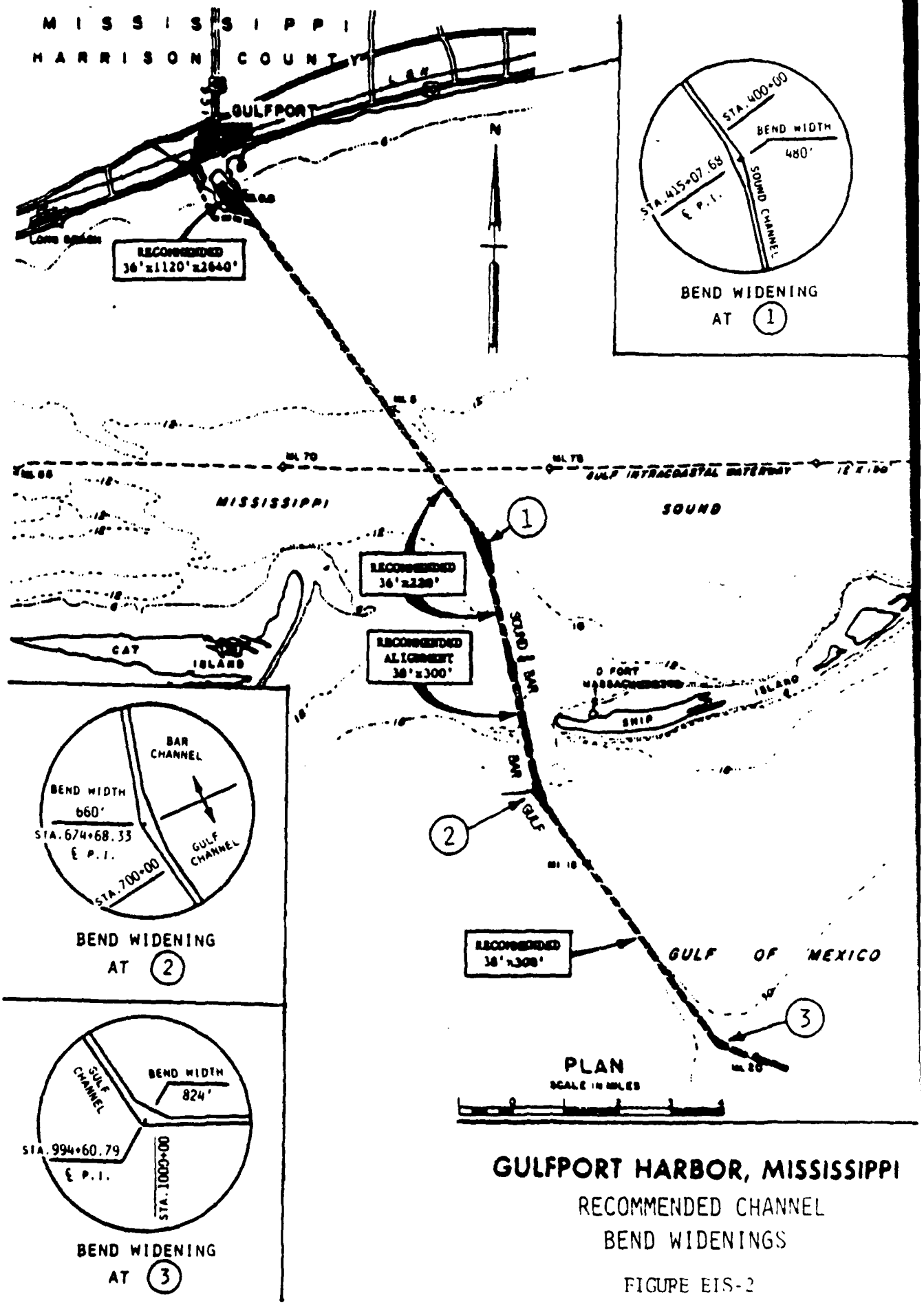


EIS-72

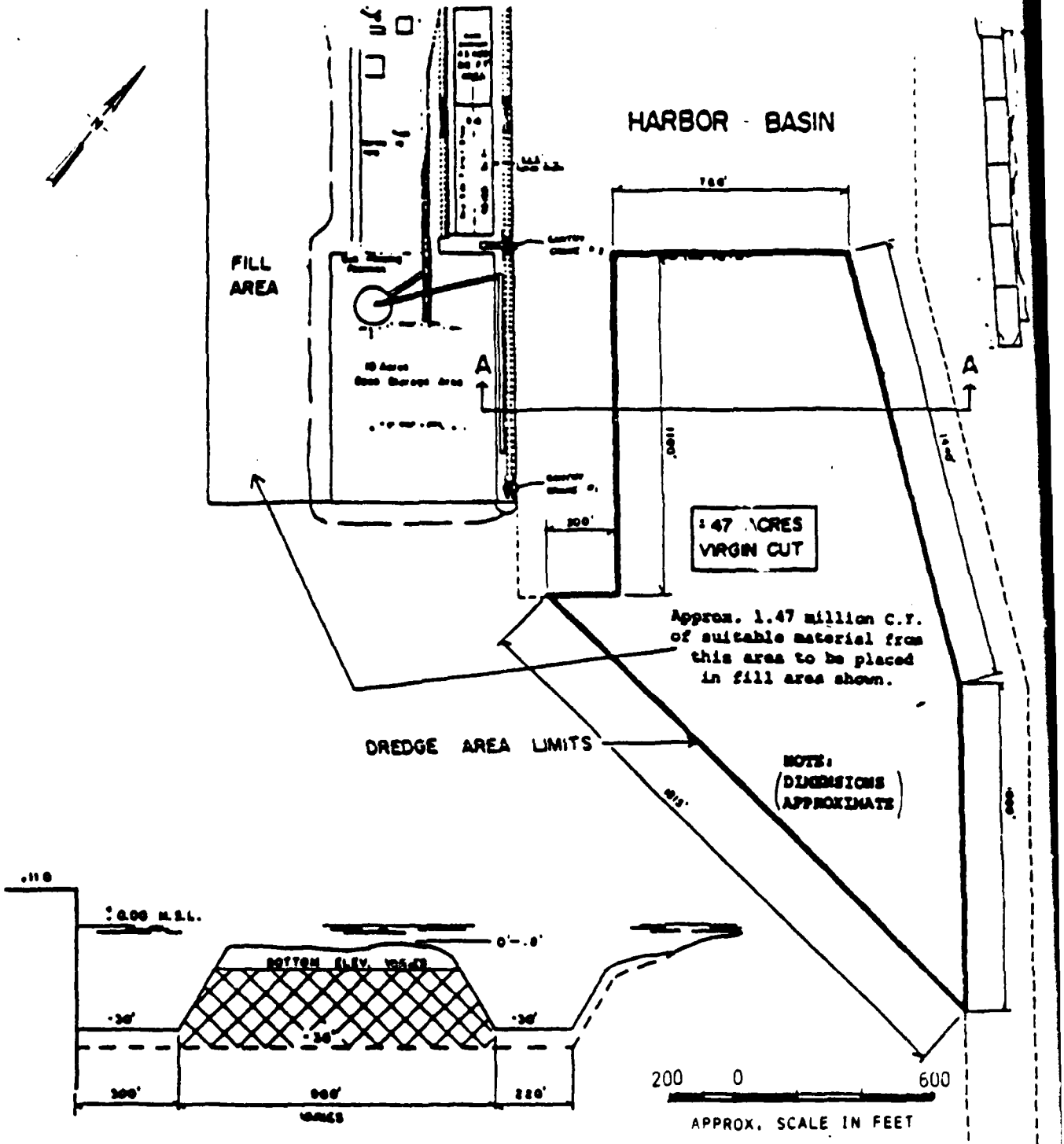
FIGURE EIS-1



GULFPORT HARBOR, MISSISSIPPI

RECOMMENDED CHANNEL
BEND WIDENINGS

FIGURE EIS-2



SECT. "A-A"
(NOT TO SCALE)

SOURCE:
PERMIT APPLICATION BY
MISSISSIPPI STATE PORT AUTHORITY.

GULFPORT HARBOR, MISSISSIPPI

PORT AUTHORITY'S PLAN
FOR PORT EXPANSION

FIGURE EIS-3

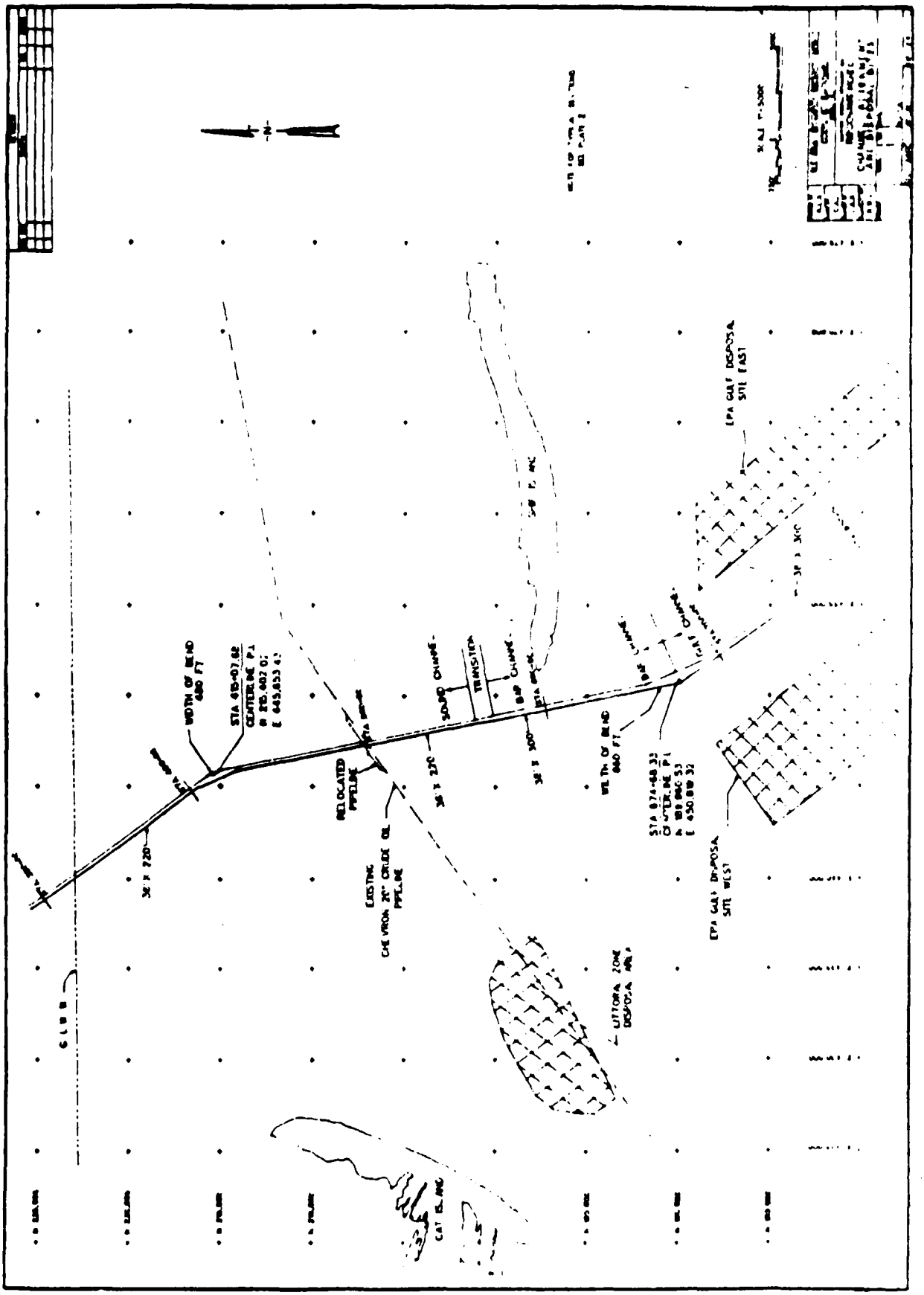

EPA GULF DISPOSAL SITE EAST
EPA GULF DISPOSAL SITE WEST
RELOCATED PIPELINE
EXISTING CHEVRON 20" CRUDE OIL PIPELINE
SOUND CHANGE
TRANSITION
BAR CHANGE
WIDTH OF BEND 880 FT
LITTORAL ZONE DISPOSAL AREA
CAT ISLAND

FIGURE EIS-4

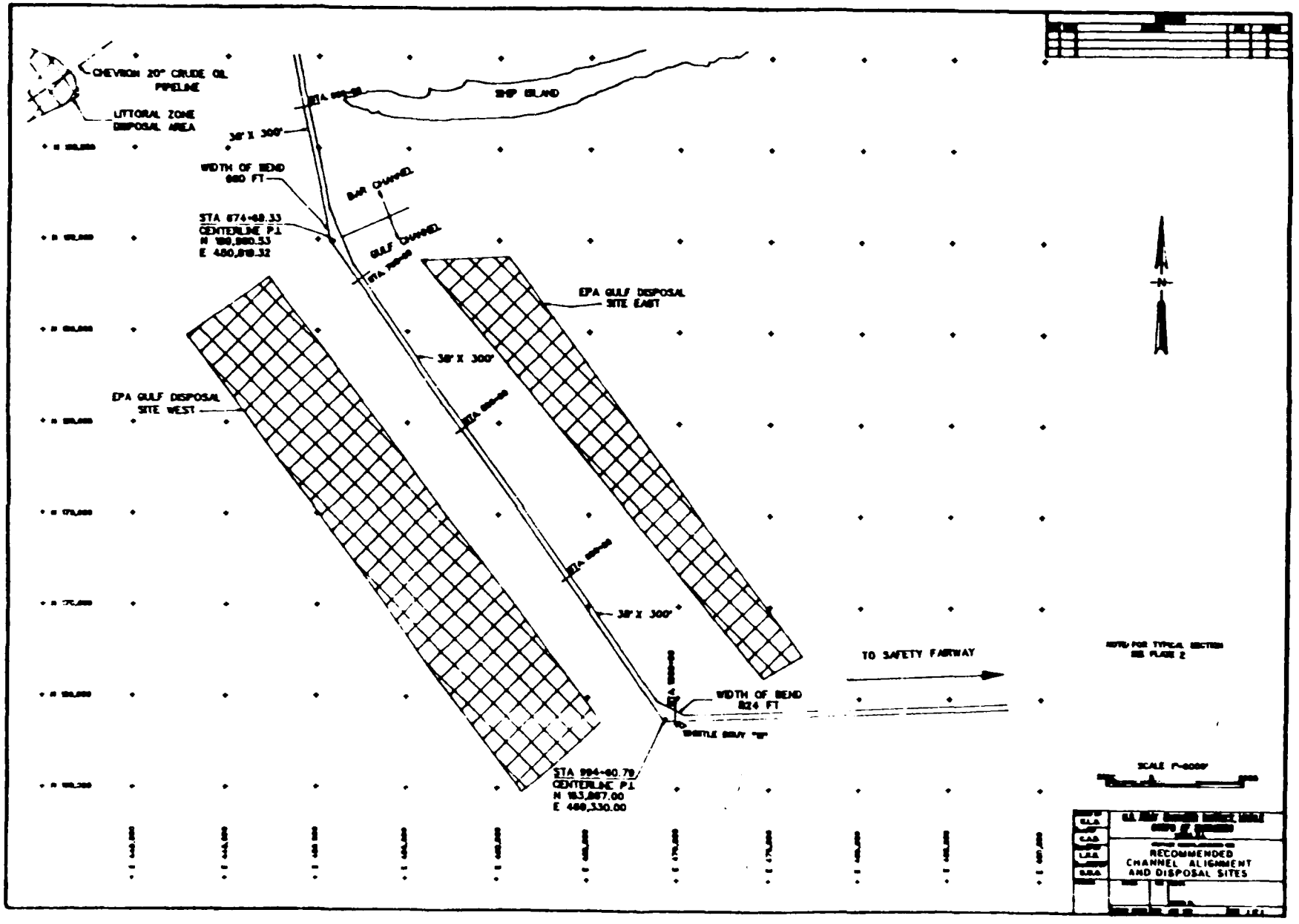

CHEVRON 20" CRUDE OIL PIPELINE
LITTORAL ZONE DISPOSAL AREA
SHIP ISLAND
38' X 300'
WIDTH OF BEND 880 FT
BAR CHANNEL
GULF CHANNEL
STA 674+48.33
CENTERLINE P.I.
N 189,880.53
E 480,878.32
EPA GULF DISPOSAL SITE EAST
EPA GULF DISPOSAL SITE WEST
38' X 300'
38' X 300'
TO SAFETY FAIRWAY
WIDTH OF BEND 824 FT
SHIRTLE BRAY "B"
STA 994+60.79
CENTERLINE P.I.
N 183,887.00
E 468,330.00
SCALE 1"=6000'
RECOMMENDED CHANNEL ALIGNMENT AND DISPOSAL SITES

FIGURE EIS-5

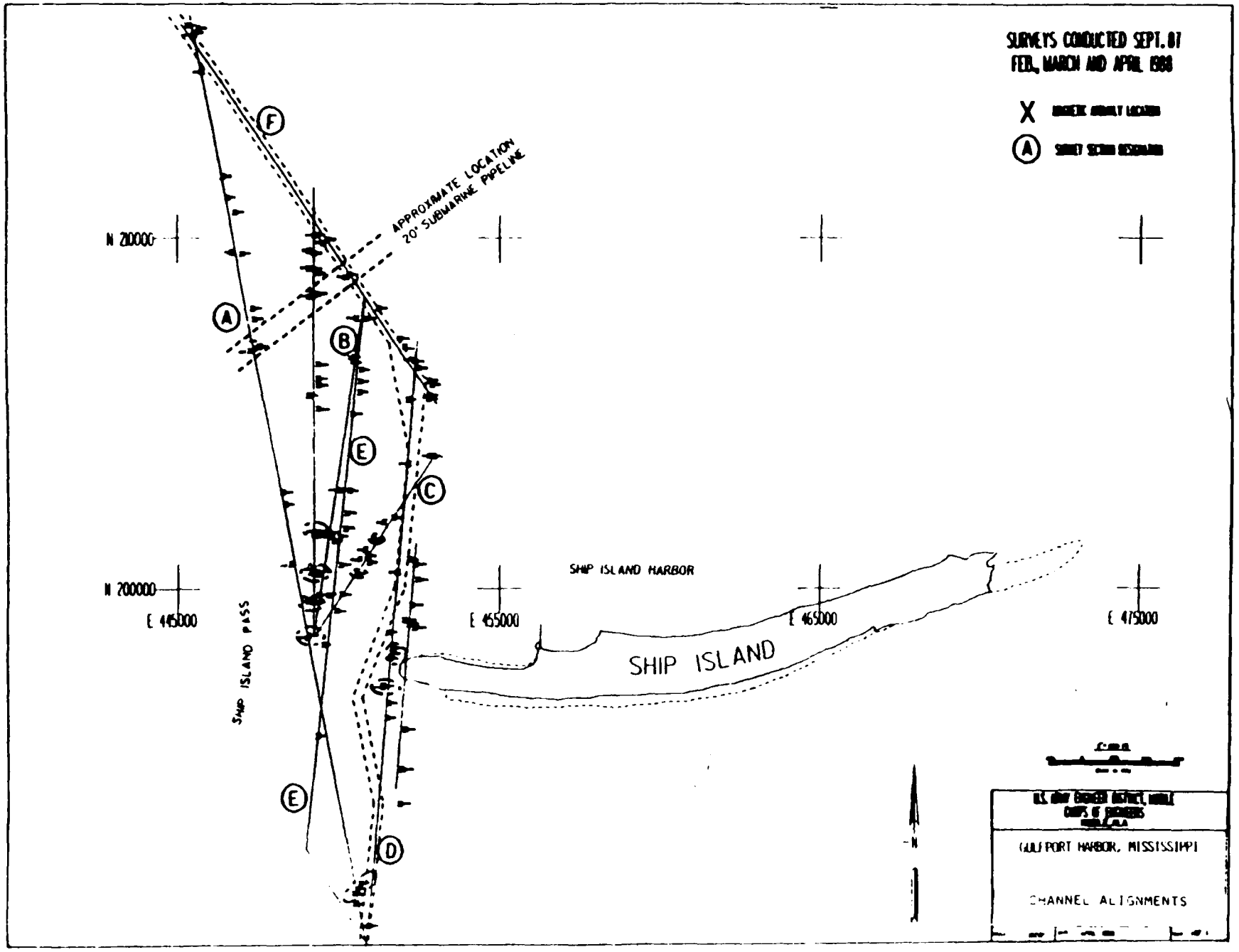

SURVEYS CONDUCTED SEPT. 87
FEB., MARCH AND APRIL 1988
APPROXIMATE LOCATION
20' SUBMARINE PIPELINE
N 210000
N 200000
E 445000
E 465000
E 465000
E 475000
SHIP ISLAND HARBOR
SHIP ISLAND
SHIP ISLAND PASS
A
B
C
D
E
E
F
N
GULFPORT HARBOR, MISSISSIPPI
CHANNEL ALIGNMENTS

FIGURE EIS-6

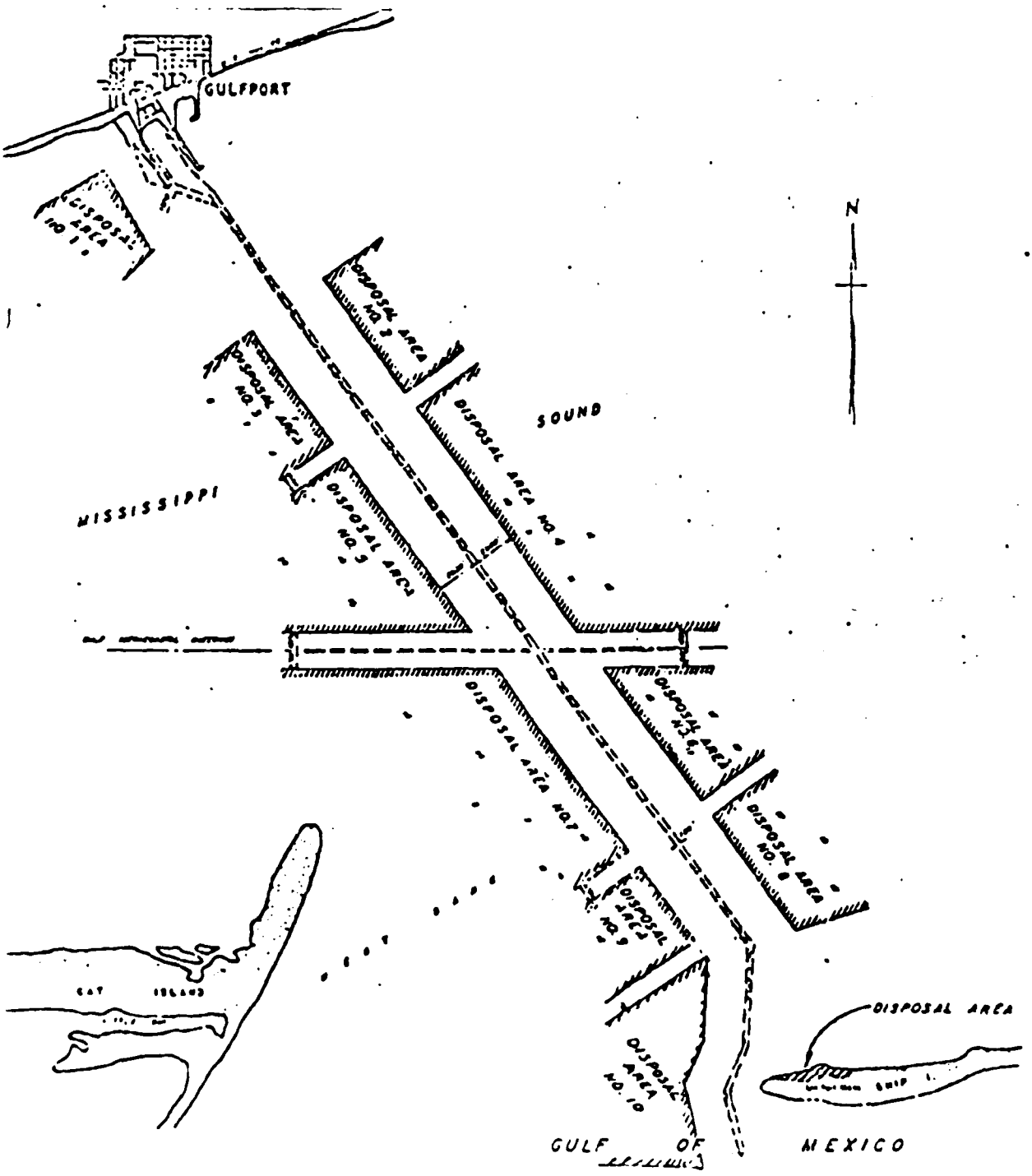

GULFPORT
DISPOSAL AREA NO 1
DISPOSAL AREA NO 2
DISPOSAL AREA NO 3
DISPOSAL AREA NO 4
DISPOSAL AREA NO 5
DISPOSAL AREA NO 6
DISPOSAL AREA NO 7
DISPOSAL AREA NO 8
DISPOSAL AREA NO 9
DISPOSAL AREA NO 10
DISPOSAL AREA
SOUND
MISSISSIPPI
CAT ISLAND
GULF OF MEXICO
N

FIGURE EIS-7